Railway Age
AND RAILWAY REVIEW
DAILY EDITION

FIRST HALF OF 1928. No. 24C NEW YORK—FRIDAY, JUNE 22, 1928—ATLANTIC CITY SEVENTY-THIRD YEAR

MINER

CLASS A-19-XB

A POWERFUL FRICTION GEAR
USED WITH ORIGINAL TANDEM
SPRING ATTACHMENTS

W. H. MINER, INC. CHICAGO

A "Who's Who" of users of G-E equipped gas-electric cars

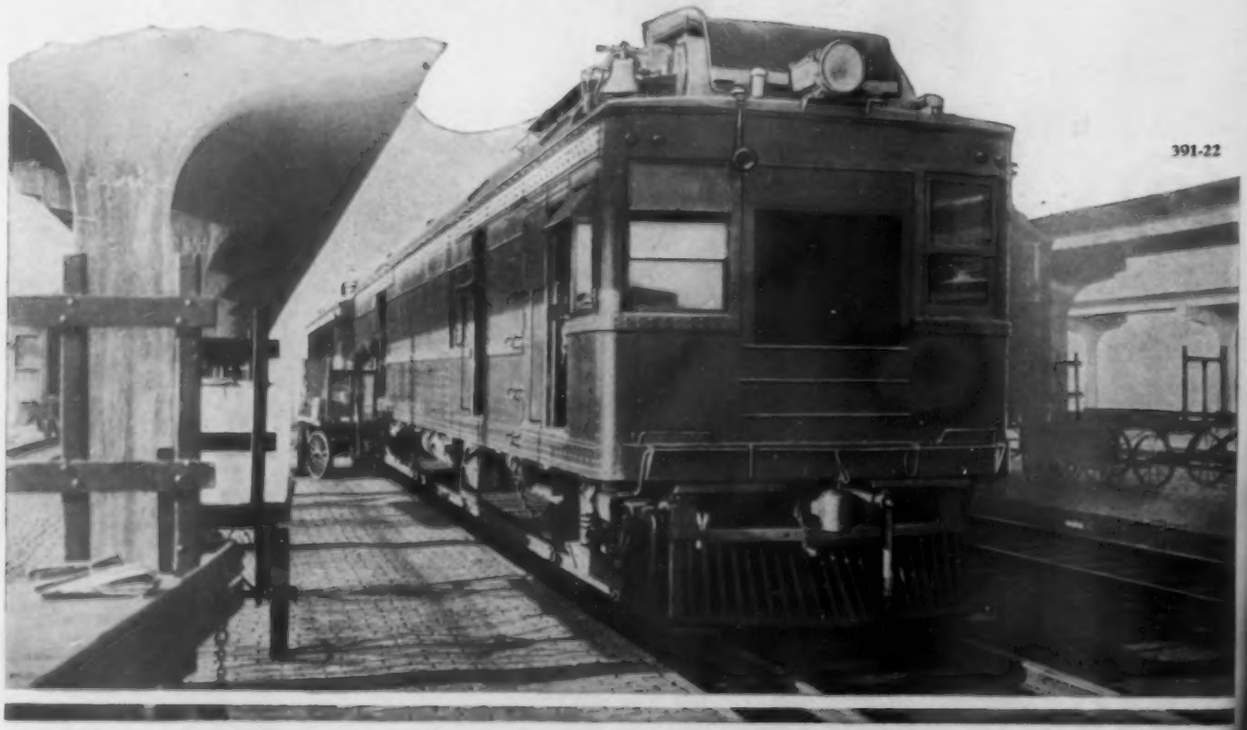
The ability of the G-E equipped gas-electric car to meet the requirements of light-traffic service is indicated by the following list of gas-electrics which are in service or on order:

*Atchison, Topeka & Santa Fe	3	Maryland & Pennsylvania	1
*Boston & Maine	14	Mexican National	1
*Canadian National	10	Minneapolis, St. Paul & S. Ste. Marie	1
Central of Vermont	1	*Missouri Pacific	11
Cincinnati Northern	4	Missouri-Kansas-Texas	1
*Chicago, Burlington & Quincy	44	*Mobile & Ohio	8
*Chicago & Alton	7	*New York Central	5
*Chicago Great Western	2	New York, New Haven & Hartford	1
*Chicago, Milwaukee, St. Paul & Pacific	10	*Northern Pacific	13
*Chicago & North Western	27	Pennsylvania Railroad	14
*Chicago, Rock Island & Pacific	25	*Seaboard Air Line	12
Grand Trunk Western	1	*St. Louis & San Francisco	7
*Great Northern	18	Toronto, Hamilton & Buffalo	1
Lehigh & New England	1	United Railways of Cuba	8
*Lehigh Valley	15	*Union Pacific	19
Louisville & Nashville	1	Victorian Railways, Australia	1
		Wabash	2

Total 289

*These 18 companies have each placed one or more repeat orders for G-E equipped gas-electric cars.

GENERAL ELECTRIC



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Fire Hazards in the Garage

THE National Fire Protection Association, at its annual meeting held during May in Atlantic City, approved as a tentative standard with few changes, a committee report containing regulations for the construction and operation of motor-coach garages. The regulations deserve immediate study by all motor coach operators who would keep down their fire insurance premiums. The rules indicate essential features of construction which, in new garages, should be followed as a matter of course. But the great majority of the companies must get along with existing facilities. What are they to do? These companies should not continue to close their eyes to the mechanics and drivers who make a joke of "No Smoking" signs and of orders forbidding this dangerous practice. Employees violating these rules should be severely penalized. Where extra-hazardous repair operations are necessary, these companies should discontinue the utilization of open storage space for this work and use a room set apart by fire-resistive walls that can be erected at a nominal cost. They should not continue to neglect the installation of fairly simple devices, such as are essential to ventilate spray-painting booths and pits used for repair and inspection purposes. Last, but not least, where it is necessary for a company to use existing facilities, fire-fighting equipment should be given unexpected tests to insure that it is in good working order. In the larger garages, the men should be properly instructed as to what to do in an emergency. Few motor coach operators are guilty of all the bad practices just enumerated. Many of them, however, are guilty of one or two of them. Modern methods of fire prevention are at the service of every company.

See Improvement in Motor Transport Equipment

EVEN a casual inspection of the motor coaches, motor trucks and other automotive equipment on display in Marine Hall will disclose the improvements that have been built into these products since the last exhibit at Atlantic City two years ago, but only a thorough study of them will bring a full realization of all the betterments that the manufacturers have brought about. Motor vehicles are still in a state of development and they always will be. New demands will constantly require new changes in design and new capacity for doing still better the job at hand. Evidence that the manufacturers are keeping pace with the requirements of motor vehicle operators is to be seen in the Marine Hall exhibit. The new refinements in motor coach chassis and body design are all in the direction of greater speed, economy in operation and maintenance, and still more comfort for passengers. The many different kinds of motor coaches on the floor are a recognition that no one unit will provide the best performance for every kind of operation. Improved performance, whether on the road or in the garage, is likewise embodied in the motor trucks, automotive accessories and equipment for motor vehicle maintenance which are to be seen in Marine Hall and on the Pier. The equipment at the exhibit is significant as an indication of the changes which are taking place in the transportation business.

Journal Lubricating Devices in the Exhibit

INCLUDED in the exhibit this year are at least seven devices designed to provide more positive lubrication for car and locomotive journals. Six of the devices are inserted in the journal box for the purpose of assisting the capillary action of the waste in delivering the lubricant to the journal. Of these, several are provided with an arrangement whereby the waste is agitated by the lateral movement of the axle. The seventh device provides lubrication without the use of the orthodox packing. All of these devices are designed to conform with the A. R. A. standard dimensions, and six of them can be inserted without changing the dimensions of the journal box. Every effort has been made to design the lubricators so that they can be applied with a minimum of effort. The fundamental reason that has prompted the designers to develop journal lubricators is to improve the ordinary methods of supplying oil to journals. Additional reasons for their development are to reduce maintenance costs and the consumption of oil and packing; to reduce the number of hot boxes, thereby increasing operating efficiency, and to furnish a more positive means of supplying oil to the journal. So many evidences of constructive development in journal lubrication which, until now, has remained practically in its primitive state, are very encouraging. While perhaps not regarded as a major problem of the designer, the insuring of effective journal lubrication

is a major problem of the car department. Any improvement in it will increase the reliability of train service and decrease the expenditures for equipment maintenanc.

Can Motor Rail Cars be Standardized?

DURING Thursday's discussion of the report on automotive rolling stock, it was suggested that the committee might well devote some thought to the problem of standardizing motor rail car equipment. It is hardly necessary to add emphasis to the fact that even in the case of equipment which has become fairly well stabilized as far as development is concerned, there are many obstacles to standardization. Among those who have had a great deal of operating experience with motor rail cars, the suggestion was not received with much enthusiasm. One member in mentioning the fact that the road with which he is connected is operating 36 units, drew a picture of the difficult problem of standardization in such a case, their experience being that before they really get a new piece of equipment broken in, it is found not to be adequate for rapidly-changing operating conditions. He concluded by saying that there did not appear to be much of an opportunity for standardization while the development of motor rail cars continues to progress at as rapid a rate as at present. More than any other type of equipment, the motor rail car is comparable to the automobile. Rapid development in the automotive field has not permitted standardization to be carried out to any great degree by the user. It is, however, a fact so well known as possibly to not be entirely appreciated that, in lieu of standardization, the industry has developed elaborate servicing facilities in the matter of replacement parts. Too much effort toward standardization in motor rail cars at the present time might tend to retard development. It would seem that the thing to do would be to build up the most efficient possible servicing facilities. In this the manufacturers can undoubtedly render much assistance.

Educational Possibilities of the Moving Pictures

ONE of the interesting features of the Mechanical Division session Thursday morning, was the moving picture, "Operation of the Steam Locomotive," developed on the Santa Fe and shown by John Purcell, assistant to the vice-president. As Mr. Purcell explained, this is an educational film designed to visualize the principal features of locomotive construction and operation to officers, crews and mechanical department forces in general on the Santa Fe. Its value in stimulating a great amount of interest in this subject has been amply demonstrated at approximately 75 fuel meetings, 20 shop council meetings, and off the line on numerous occasions at universities and smoke prevention meetings. Probably 8,000 or more Santa Fe employees have seen the picture. Displayed in two reels, the picture was exceptionally well received at the meeting Thursday, and at one point the audience spontaneously applauded. The animated charts or drawings were clearly prepared and instructive and the views of locomotive terminal conditioning operations, such as taking coal, water and sand, cleaning, blowing down, filling, firing up, etc., proved highly interesting. Unquestionably the information afforded by this moving picture was already known to practically every member of the Mechanical Division who saw it, but the admirable character of the display and the possibilities of instruction and desirable publicity by the use of this modern educational vehicle, could hardly fail to prove enlightening and convincing.

A New Era of Locomotive Performance

MANY locomotives that have been purchased during recent years, although new in every respect, cannot be called modern. This is a rather harsh statement to make, but considering the mass of evidence that has been accumulated from a large number of plant and road tests made during the past four years, no locomotive is modern without modern auxiliaries; neither is it an economical producer of horsepower. Undoubtedly, Cole's steam consumption figures of 20.8 lb. per cylinder horsepower-hour and coal consumption of 3.25 lb. per cylinder horsepower-hour are good figures for locomotives of ordinary design, but there are a number of locomotives in service today with a steam consumption as low as 17.5 lb.—one of these averages 17.91 lb. in daily operation—and a coal consumption of about 2 lb. All of these locomotives, naturally, represent the latest in modern design, which includes all the auxiliaries and features of design that make for increased capacity and economy. Such fuel and water rates, together with the locomotive proportions and appliances by which they have been made possible, are so far outside the ranges contemplated in Cole's ratios that the latter are in evident need of revision.

Purchased vs. Generated Power

THE paper presented by Dean Potter, of Purdue, on Railroad Power Plants at Thursday's meeting is unique by virtue of the concise brevity with which an involved subject of this nature is treated. An outstanding example of this brevity is a formula for determining whether power for a certain facility should be purchased from a utility corporation, or generated in a railroad power plant.

The formula is as follows: "In general, local conditions will determine the choice between purchased power and an isolated plant. Where sufficient use can be found for exhaust steam the major portion of the year and where considerable steam is needed for driving special equipment, the isolated plant should receive favorable consideration. Ordinarily, if 15 to 25 per cent of the power can be generated as a by-product of the heat supplied for other purposes, it is advantageous to consider an isolated power plant to carry all or a part of the load. In some cases pooling of the energy with the electric utility may even be practical. In many cases it is desirable to retain the present plant for heating and for generating a portion of the load and purchase the remainder from a utility. In small shops it is usually not advisable to construct a power plant, but better results are accomplished by installing a low-pressure plant for heating and by purchasing electricity for light and power from a utility." It is not to be expected that anything so simple as this can be universally applied, but it should serve as a useful benchmark from which any situation can be considered and a decision reached as to the need for making a detailed study.

Sand House Talk

WHAT can be done to provide better facilities for drying and handling sand at locomotive terminals? At many terminals where hand-shoveling of coal and cinders became obsolete years ago, it is still the practice to shovel and wheel the green sand by hand, dry it in stoves of the most antiquated type, which are constantly burning out, and finally to elevate the dried sand to a delivery tank by compressed air without consideration for the cost of compressing air or maintenance of pipe lines that are rapidly cut out by the sand. One progressive road, that spends three-quarters of a million dollars annually for sand, found that a steam sand dryer is about 40 per cent more efficient than stoves, even with live steam. Where exhaust steam is available and the dryer is designed for drying the requisite quantity of sand with exhaust steam, the saving is even greater. It was also found that if the finest particles of sand, as well as the coarser particles are screened out, the sand delivered to locomotives will be much more effective and consequently there will be less sand used. The test department on this road recommends that when drying sand, everything that sifts through an 80-mesh screen, as well as all that passes over a 20-mesh screen, be discarded. One more suggestion for the new terminals: Give sand handling and storage facilities proportionally as much thought as is customarily given to the coaling facilities. Use the coal unloading hopper for sand or provide a separate hopper of adequate size. Elevate the sand with a skip hoist to a green-sand bin at sufficient height so that the sand will flow by gravity into an overhead dryer and thence by gravity to the dry-sand delivery pocket, thus eliminating all manual handling.

P. & S. Division Attendance

AN analysis of the lists of railway officers attending the annual meetings of the Purchases and Stores Division for the past five years brings out the interesting fact that while the place of the convention determines very largely the number of delegates from individual roads, the total attendance is little, if any, affected. In 1923 the meeting was held at Chicago and that year 85 roads were represented and 374 officers were present. In 1924 the meeting was in Atlantic City and there were 96 roads represented and 461 officers present. In 1925 the meeting was in St. Louis, Mo., and the figures show 73 roads and 443 delegates. In 1926 it was in Atlantic City and attended by 442 officers from 84 roads, while in 1927 the meeting was in Chicago, attended by 497 delegates from 86 roads.

The influence of the place of meeting is shown by the figures for a few of the roads sending the largest number of delegates. The Pennsylvania sent 81 officers to Chicago in 1923, 98 to Atlantic City in 1924, 64 to St. Louis in 1925, 124 to Atlantic City in 1926, and 49 to Chicago in 1927. The Illinois Central sent 10 to Chicago in 1923, 6 to Atlantic City in 1924, 22 to St. Louis in 1925, 9 to Atlantic City in 1926, and 57 to Chicago in 1927. The New York Central Lines sent 4 to Chicago in 1923, 21 to Atlantic City in 1924, 13 to St. Louis in 1925, 25 to Atlantic City in 1926, and 16 to Chicago in 1927. The Union Pacific sent 12 to Chicago in 1923, 10 to Atlantic City in 1924, 9 to St. Louis in 1925, 9 to Atlantic City in 1926, and 14 to Chicago in 1927; while the Chicago, Burlington & Quincy sent 8 to Chicago in 1923, only 4 to Atlantic City in 1924, 20 to St. Louis in 1925, only 5 to Atlantic City in 1926, and 21 to Chicago in 1927. In general, while a few roads have been represented in about the same numbers each year regardless of the place of meeting, it is apparent that the railroads send a greater number of delegates to meetings held close by than at a distance.

Today's Program

THREE railroad conventions will meet in Atlantic City today. Their programs follow:

Mechanical Division

The meeting will be called to order in the Greek Temple on the Million Dollar Pier at 9.30 A. M., Daylight Saving Time. It will adjourn at 12.30 P. M.

Address: A. G. Pack, Chief Inspector, Bureau of Locomotive Inspection, Interstate Commerce Commission.

Discussion on Reports on:

Lubrication for Locomotives.
Locomotive and Car Lighting.
Electric Rolling Stock.
Utilization of Locomotives.

Purchases And Stores Division

The convention will assemble in the Vernon Room of Haddon Hall Hotel at 9 A. M., Daylight Saving Time, and will adjourn at 1.30 P. M.

Individual Paper—"A Dollar Carefully Expended," by Wm. W. Morris, Assistant General Purchasing Agent, The Pennsylvania Railroad.

Subject 8—Control of Shop Manufacturing Orders for Stock Material.

Subject 11—Unit Pricing of Materials and Unit Piling.

Subject 14—Fire Prevention.

Subject 17—Stores Department Safety Practices.

Individual Paper—"Consignment Stocks, Advantages and Limitations."

Subject 18—Uniform Methods Pertaining to Purchases of Equipment and Large Material Contracts, and Vital Statistics Relating to Purchases.

Subject 20—Joint Committee on Metric System.

Subject 9—Joint Committee on Fuel Conservation.

Subject 7—Workable Rules in Connection with the Carrying Out of the Provisions of Section 10 of the Clayton Anti-Trust Act.

Reports of Resolutions and Memorials Committees.

Report of Nominating Committee and Election of Officers.

Motor Transport Division

The meeting will be called to order in the Rose Room of the Hotel Traymore at 10 A. M., Daylight Saving Time.

Report of Motor Truck Section—G. C. Woodruff, Chairman.

Discussion of motor truck problems submitted by the members.

NOTE—Attendance at the sessions will be confined to railroad representatives.

Entertainment

10.30 a. m.—Orchestral Concert, Entrance Hall, Million Dollar Pier.

3.30 p. m.—Orchestral Concert and Impromptu Dancing, Entrance Hall, Million Dollar Pier.

8.00 p. m.—Concert, Million Dollar Pier.

9.00 p. m.—Cotillion Night in the Ball Room, Million Dollar Pier, under direction H. T. McConnell, Chicago, Ill. Special Features, Reading Co. Seashore Band, John L. Snyder, Director.

Lost

LOST Badges 7412 and 8670—If found please return to the office of J. D. Conway, secretary-treasurer, R. S. M. A., or to the Enrollment Booth.

Omaha Orders Stock Cars

The Chicago, St. Paul, Minneapolis & Omaha has ordered 250 single-deck stock cars from the Pullman Car and Manufacturing Corporation.

Motor Coach Orders

THE Union Pacific Stages, Inc., Portland, Ore., and the Southern Pacific Motor Transport Company, Salem, Ore., have ordered, respectively, two and one 27-passenger parlor coaches from the American Car & Foundry Motors Company.

R. S. M. A. District Elections

DISTRICT elections for members to the Executive Committee of the Railway Supply Manufacturers' Association will be held in the Executive Committee room at the shore end of Assembly Hall, Million Dollar Pier, Saturday, June 23, 1928, between the hours of 10.00 and 11.00 a. m., Daylight-Saving Time.

Vacancies to be filled are as follows:

Second district—Two members, term three years
Third district—One member, term three years
Fourth district—One member, term three years
Seventh district—One member, term three years
Eighth district—One member, term three years

R. S. M. A. Annual Meeting

THE annual meeting of the Railway Supply Manufacturers' Association will be held in Convention Hall, at the ocean end of the Million Dollar Pier, on Saturday, June 23, 1928, at 11.30 a. m., Daylight Saving Time.

The nominating committee of the Railway Supply Manufacturers' Association yesterday submitted its report. The selections were as follows: President, Gilbert E. Ryder; vice-president, Sidney G. Down. The make-up of the nominating committee was: Leroy S. Wright, chairman, Col. George S. Morton, Frank Lanahan, W. H. Coyle, H. W. Frost, Sterling H. Campbell, Pearl R. Diamond and J. G. Platt.

George Barden Passes Away

GEORGE A. BARDEN, of Philadelphia, died suddenly on Wednesday afternoon. While Mr. Barden has not been in the best of health, his death came unexpectedly. It is only a few days since he visited Atlantic City and discussed the prospects of the convention with Secretary Conway of the R. S. M. A. Mr. Barden was the eastern representative of the King Pneumatic Tool Company of Chicago, and prior to that was for a great many years connected with the Chicago Pneumatic Tool Company. He has been an active worker at the conventions, having served for eight years on the Enrollment Committee.

Railroads Well Represented on Committees of Division VI

A FEATURE of the committee work of the Purchases and Stores Division is the manner in which the work of the various committees has been apportioned among the different railroads. Of 18 active committees, having a total of 211 members, a check shows that 65 railroads are represented. Of this number the Pennsylvania has the largest number, with a total of 20, the Southern Pacific ranks second with 14, and the Union Pacific is third on the list with a total of 10. The Illinois Central has nine of its purchases and stores officers serving on committees of Division VI, and the Santa Fe, the Canadian National, the Burlington, and the Missouri-Kansas-Texas each have eight.

Out of the total of 211 members serving on committees during the past year, 65 are members who have never had any previous service in the committee work of Division VI. Furthermore, most of the committees are in charge of members who, while serving as committee chairmen for the first time, have given several years to the committee work.

Of the 18 active committees, the Committee on Reclamation has the largest membership, with a total of 18. The next largest committees, each of which has a membership of 15, are the Committee on Records and Office Organization, the Committee on Delivery of Material and the Committee on Control of Line Stocks, which is a new committee appointed last year. The average number appointed to serve on a committee during the past year was nine, and the smallest number serving on any committee was three.

Railroad Club Secretaries Meet

RAILROAD club secretaries have an eye single to the objects of the organizations whose best interests they endeavor faithfully to serve. This was again shown in the time and thought they gave to the methods and practices of the clubs at the meeting of their society, yesterday, at the Marlborough-Blenheim.

Recommendations to executive committees were agreed upon after several hours' discussion of features expected to add to the beneficial results of club work and the increased usefulness of the secretaries. These propositions contemplate more effective results of membership campaigns and benefits assured to club members, expansion work which it is felt is essential to securing the best results, and making club programs so attractive that none can afford to be absent from meetings without incurring personal loss of valuable advantages.

One of these suggestions is designed to be helpful to ambitious young railroad men coming up from the ranks and not yet able to incur the expense of club membership. The idea is to give them the benefit of papers and talks designed to enlarge their sphere of knowledge and experience until such time as position and its emoluments make it possible for them to become active participants.

The membership of the society was increased by the admission of the Norfolk-Portsmouth Club of Virginia, a new organization at present made up largely of men connected with the Seaboard Air Line. It originated with two general foremen, and with the chief clerks who are now identified with it, it is destined to grow and be so broadened that other railroads will be willing to ally themselves with this body of men with progressive ideas.

The society is desirous of again meeting annually instead of every two years while waiting for an Atlantic City convention of the A. R. A. bodies, and it may do so.

Actuated by appreciation of the interest and labors of the officers of the past two years, they were continued, and are: chairman, Charles R. Crook, Montreal, Canadian Railway Club; vice-chairman, A. T. Miller, Atlanta, Southern & Southwestern Club; secretary-treasurer, Harry D. Vought, New York, representing both the New York and Central Clubs.

Additional Exhibitor

A NEW exhibitor has been added since the Wednesday *Daily Railway Age* went to press, as follows:

Williams-Hayward Company, Chicago.—Color combinations for interiors of passenger cars. Represented by L. A. Williams and Oscar C. Hayward. Space 515.

Extension of P. & W. Va. Approved

THE Interstate Commerce Commission yesterday made public a decision by a five to four vote, authorizing the Pittsburgh & West Virginia to build the proposed extension from Cochran's Mill to Connellsville, Pa., 38 miles, at an estimated cost of $12,800,000. This had been opposed by the Pennsylvania, Nickel Plate, Baltimore & Ohio, and Wheeling & Lake Erie. The line was proposed as an important link in a possible fifth eastern system, but the Commission says it was considered on its own merits, separate from the question of grouping of other roads.

Grand Ball a Big Success

THE entertainment features of yesterday morning, afternoon and at night were marked with large attendances.

The usual orchestral concerts were given in Entrance Hall on the Million Dollar Pier both morning and afternoon.

The Grand Ball in the evening in Entrance Hall was given in honor of Divisions V, VI and VIII of the American Railway Association. Entrance Hall never looked prettier. From the time of the grand march until the early morning the dancing floor was filled.

A word of commendation is certainly due the Entertainment Committee and to its efficient chairman and vice-chairman, J. W. Fogg and C. J. Nieman, and their associates for the success of this entertainment. The sub-committee in charge of last night's Grand Ball consisted of L. J. McCombs, chairman; C. R. Naylor, vice-chairman; L. B. Rhodes, S. L. Bateman, C. W. Sullivan, A. G. Johnson, S. B. Wright, Jr., A. E. Biddle, F. W. Venton, W. B. Keyes, C. L. Mellor, C. L. Brown, F. E. Symons, E. E. Thulin, J. L. Rowe, Bard Brown, and N. C. Naylor, master of ceremony.

Lectures of Dr. Lipetz at Purdue University

DURING Thursday's session of the Mechanical Division, Dean Potter of Purdue University made an announcement that the University has made an arrangement with the American Locomotive Works by which Doctor Lipetz, consulting engineer of that company, is devoting a week each year to a series of lectures on locomotive design and construction at Purdue. This year the series of lectures will be given from October 29 to November 2. Dean Potter, on behalf of Purdue University, extended an invitation to the members of the Mechanical Division to be present during that week to hear Doctor Lipetz present his lectures. In due time formal letters of invitation and programs will be mailed to members of the Division.

Registration Figures

THE registration figures of yesterday, the second day, were very satisfactory, as the following totals for the years 1920 to 1928, inclusive, will show.

	1920	1922	1924	1926	1928
Mechanical, Division V	490	478	650	775	680
Purchases and Stores, Division VI	24	16	17	400	477
Motor Transport, Division VIII					30
Railroad guests					90
Railroad ladies	344	337	475	650	700
Supply men	1955	1771	2115	2411	2257
Supply ladies	490	384	484	570	544
Special guests	190	180	305	250	17
Complimentary					242
	3493	3166	4046	5056	5037

Registration, American Railway Association

Division V—Mechanical

Anderson, J. B., Gen. Agt., Penna., Runnymede
Anderson, S. H., S. M. P. & E., Pac. Elec., Haddon Hall
Barnhart, S. H., M. P. Dept., N. & W., Ritz-Carlton
Barrett, C. D., Asst. Eng. Tests, Penna.
Barry, J. J., Asst. to S. M. P., N. & M., Ritz-Carlton
Battley, E. R., S. M. P., G. T., Chalfonte
Belk, M. S., Gen. A. B. Instr., Sou., Kenderton
Benger, F., Asst. Mech. Engr., C. P. R., Haddon Hall
Bennett, Thos. W., Foreman Pass. Car Dept., C. of N. J., Madison
Berg, Carl, Asst. S. M. P., P. & L. E., Brighton
Bergman, H. S., Shop Foreman, B. & O., Brighton
Black, H. P., Gen. Car Insp., D. T. & I.
Blossom, Harry F., Ch. Draft., N. Y. C., Jefferson
Bowie, E. G., Dist. M. M., C. P. R., Ritz-Carlton
Bracken, J. L., Asst. to Mech. Supt., N. Y., N. H. & H., Chalfonte
Brown, C. G., Jr., Asst. M. M., Penna., Chalfonte
Buck, E. R., Gen. For., Penna.
Budell, Leigh, Mech. Eng., R. F. & P., Ambassador
Burns, John, Works Mgr., C. P. R., Haddon Hall
Burton, T. L., A. B. Eng., N. Y. C., Marlborough
Butler, F. A., S. M. P. & R. S., B. & A., Marlborough
Butler, James, M. M., Ann Arbor, Ambassador
Carlson, W. A., Gen. M. M., Erie, Haddon Hall
Carmody, J. A., Supt. Elec. Equip., N. Y. C., Chalfonte
Carroll, J. F., R. F. E., N. Y., N. H. & H., Haddon Hall
Case, H. C., Supt. of Prod., N. Y., N. H. & H., Carolina Crest
Chambers, J. C., Ret., S. M. P., A. C. L., Chalfonte
Chapman, Nelson, Elec., Penna., Madison
Clark, F. H., Con. Eng., Dennis
Clayton, Frank T., Eng., Penna., Pleasantville, N. J.
Clugh, Clair L., M. P. Insp., Penna.
Coe, T. W., S. M. P., N. Y. C. & St. L., Shelburne
Cole, Carter S., Gen. For., Penna.
Copell, H. A., Foreman, N. Y. N. H. & H., Vermont Apts.
Cordic, P. R., For., B. & O., Haddon Hall
Courtney, H., Supt. Shops, P. & L. E., Brighton
Cramblitt, L., Supv. Loco. Oper., B. & O., Monticello
Crawford, A. A., S. M. P., Y. & O.
CromWell, Oliver C., Asst. to Ch., M. P. & E., B. & O., Chalfonte

Dale, L. E., Asst. Eng., Penna.
Dalton, R. P., Cont. Cl. V. P., C. R. I. & P., Ambassador
Davis, E. R., Gen. Mgr., S. J. & E., Traymore
Day, J. C., Gen. For., Penna.
Deeter, D. H., M. M., Reading, Belvedere
Delle, D. E., Asst. Shop & Tool Spec., N. Y., N. H. & H.
Dickert, C. L., S. M. P., C. of Ga., Supt. M. P., Ritz-Carlton
Dickinson, C. M., Ch. Elec., R. F. & P., Marlborough
Ditemore, G. M., M. C. B., D. & H., Marlborough
Donalds, H., R. F. E., L. & N. E., Pennhurst
Dornburger, J. A., G. M. B. M., N. & W., Ambassador
Dwyer, E. J., M. M., B. & M., Chelsea
Dyson, C. H., Fuel Agt., B. & O., Ambassador
Edmonds, C. G., Spec. Insp., B. & O.
Eicholtz, H. M., Asst. Gen. Mgr., C. & N. W., Haddon Hall
Emley, N. B., Supv. Tools & Machy., Erie, Dennis
Emrick, V. R., Ch. Elec., F. E. C., Sterling
Farrin, J. M., Spec. Eng., I. C., Traymore
Ferral, Walter H., Elec., Penna., Madison
Ferguson, D. A., Asst. Eng., Cann. Nat., Eastbourne
Fey, P. M., Gen., B. & O.
Filskov, Harold, Asst. Supt., Raritan River
Filskov, T., Ch. Eng. & Supt., Raritan River
Fitch, H. W., Asst. Eng., N. Y., N. H. & H., Glaslyn Chata
Foertsch, Thos A., R. F. E., Reading
Gallagher, R. E., Asst. Elec. Eng., L. & N., Ritz-Carlton
Galloway, G. R., Gen. M. M., B. & O., Ambassador
Gangewere, E. P., Mech. Supv., Reading
Gee, N. E., Asst. Mgr. Mech. Eng. Dept., Penna., Willsboro
Gehret, S. S., Gen. For., Penna.
Gibboney, E. S., Gen. For. Car Dept., H. & B. T., Louvan
Gill, C. A., S. M. P., B. & O., Ambassador

Division VI—Purchases and Stores

Arndt, John W., Bureau Head Stores Dept., Reading, Osborne
Arnold, Harry M., Ch. Clk. Stores Dept., Reading, Osborne
Arnoll, R. C., P. A., Rutland, Chalfonte
Baker, J. C., Trav. Stk., Sou., Shelburne
Bennington, J. R., P. A., L. & N. E., Traymore
Boice, C. D., Secy. to P. A., F. E. C., Haddon Hall
Bowman, M. B., Stk., N. Y. C. & S. L., Knickerbocker
Boyer, J. L., Trans. Sup., Penna., Penn. Atlantic
Breene, J. G., Stk., M. C. & St. L., Marlborough
Brown, N. J., Stkpr., B. & S., Boscobee
Brown, W. C., Supvr. of Mat., B. & O., Kentucky
Clay, Wilson J., Asst. G. S., Reading
Clem, Wesley A., Ass. P. A., Reading, St. Clair
Clifford, E. A., G. P. A., C. & N. W., Marlborough
Collins, J. J., Gen. For., Erie, Haddon Hall
Driscoll, F. E., P. A., Erie, Ritz-Carlton
Dixon, O. O., P. A., I. R. T., Majestic
Doman, W. E., Stk., C. N. J., Jefferson
Elder, S. M., Lbr. Agt., B. & O., Jefferson
Evans, D. E., Asst. to G. S., L. V., Monticello
Evans, W. E., P. A., C. N., Chalfonte
Foley, F. I., G. S., N. Y., N. H. & H., Traymore
Galbraith, C. C., Ch. Clk. Pur. Dept., O. S. L., Haddon Hall
Galloway, W. S., P. A., B. & O., Brighton
Gilligan, John F., Asst. Div. Stk., C. R. R. of N. J., Hanover
Goerner, Geo. A., Trav. Stk., C. B. & S., Princess
Gowland, S I., Asst. G. S. K., Penna., Silverside
Griffith, B. W., C. S., N. Y. C., Ambassador
Grueger, B. B., Supvr. Mats., N. & W., Knickerbocker
Hagerty, J. W., Genl. Sup. P. A. Office, Penna., Penn. Atlantic
Hall, C. B., Store Mgr., Penna., Chalfonte
Haynes, Walter H., Stores Insp., Reading, New Jersey
Hobson, J. E., Stationer, Sou., Haddon Hall
Hockman, H. G., Div. Stk., C. R. I. & P., Strand
Hodges, F. A., Gen. Stkpr., S. G. L.
Holmes, J. W. A., Stk., N. & W., Knickerbocker
Hubbell, Charles C., P. A., D. L. & W., Traymore
Hughes, Wm. M., Stk., B. R. & P., Breakers
Hummel, H., Trav. Stk., G. T. W., Strand
Hunker, Geo. J., Trav. Mat. Sup., A. T. & S. F., Belmont
Illig, W. E., Stk., B. & A., Strand
Immendorf, John C., For., Reading
Irish, J. L., G. S., O. W. R. R. & N., Knickerbocker
Isenogle E .B., Div. Stk., B. & O., Knickerbocker
Jackson, J. C., Gen. Stk., G. T., Marlboro
Jackson, R. R., Div. Stk., Wabash, Strand
James, J. H., P. A., P. & L. E., Ambassador
Johnson, P. J., Stk., Penna., Monticello
Johnston, Geo. E., Gen. Stk., B. & A., Ambassador
Jones, D. T., Mat. Clk., N. Y. C., Chalfonte
Jones, Edward, Asst. Gen. Purch. Agt., W. W., Haddon Hall
Jones, M. G., Stkpr., P. R. R.
Jones, W. F., P. A. Din. Serv., N. Y. C., Chalfonte
Kegelmeyer, E. R., Stk., H. V., Strand
Kelly, C. H., Dist. Stk., L. V., Monticello
Kelly, J. T., Gen. Stk., C. M. St. P. & P., Knickerbocker
Kemmerling, B. B., Asst. Ch. Matl. Supt., Penna.
Kennedy, M. C., V. P., Penna.
Kenzel, C. H., P. A. E. J. & E., Chelsea
Kilmer, L., St. Acct., G. T. W., Strand
Kincaid, C. R. Div. Stk., B. & O., Shelburne
King, D. C., P. A., Vir., Marlborough
King, J. U., Gen. Stk., A. C. L., Haddon Hall
King, S. C., Trav. Acct. F. E. C., Princess
King, W. E., Stk., A. C. L., Dennis
Kirk, J. G., Asst. G. S., C. R. I. & P., Strand
Knabb, S. E., Asst. Ch. Cl., Reading
Krampf, L. P., Sup. Agt., N. P., Chalfonte
Kreglow, A. F., Stk., Wash. Term., Chalfonte
Lackey, A. B., Div. Stk., Sou., Colton Manor
Lacy, H. S., P. A., Jacksonville Term., Ambassador
Lamneck, E. J., Asst. P. A., Penna., Penn. Atlantic
Lance, F. H., G. S., D. L. & W., Haddon Hall
Landis, J. D., P. A., Reading
Laret, A. N., Asst. to V. P. & Ch. Pur. Off., St. L. & S. F., Traymore
Laughton, Hunter H., Asst. to V. P., So. Ry., Traymore
Lavoie, Louis, Gen. P. A. Can. Nat., Shelburne
Layton, J. L., Asst. Ch. Mat. Sup., Penna., Betz Apts
Leduc, J. E., Stk., H. V., Strand
Lendon, J. C., Stk., A. C. L., Haddon Hall
Leonard, E. J., Div. Stk., C. & N. W., Princess
Lieber, C. W., Supt. Recl., M. K. T., Ambassador
Litzleman, Geo. R., Ch. Clk. Dist. Stk., L. V., Monticello
Livingston, W. C., Stk., Penna., Grand Atlantic
Lockhart, H. A., B. & O., Jefferson
Logan, W. B., G. S. K., C. N., Princess
MacDonald, A. S., Dist. Stk., C. P., Marlboro
Mahaney, J. E., Supt. Stores, C & O, Haddon Hall
Major Gen Johnson D. S. O., Stores Supt., Central Argentine
Manion, S. R., Stk., P. R. R., Grand Atlantic
Marcean, J. E., Gen. Stk., Rutland, Chalfonte
Marsh, E. S., Gen. Stk., W. & L. E., Haddon Hall
Marshall, C. A., Div. Stk., C. R. R. of N. J., Breakers
Marshall, J. F., P. A., C. & A., Traymore
Mau, W. R. N., Asst. to G. P. A., G. C. L. I. G. N., Strand
Mayer, F. J., Stat. Buyer, I. C., Ritz Carlton
Mayer, P. C., Off. Man. Pur. Dept., I. C., Strand
McCann, Thos. J., Stk., Reading, Underwood
McCaughan J. C., G. S., H. V., Strand
McCloy, Ed. J., Stk., A. C.
McCormick, Francis R., Stk., Reading, New Jersey
McGlothlin, J. H., Gen. Stk., Vir., Marlboro
McGrath, Frank, Trav. S. K., B. & M., Haddon Hall
McIlvaine, C. L., Asst. Stores Mgr., Penna., Brighton
McKay, Paul, Asst. P. A., No. Pac., Haddon Hall
McKeand, C. H., Frt. & P. A. Tol. Term., Craig Hall
McKenzie, D. G., Div. Stk., M. & O., Haddon Hall
McKilligon, A. S., G. S., S. P., Chalfonte
McKinnon, J. J., Stk., B. & M., Ambassador
McMahon, F. J., G. S., N. Y. C., Ritz
McMahon, J. E., Asst. P. A., C. M. St. P. & O., Traymore
McNelley, J. E., Ch. Tie & Lumber Sup., A. C. L., Haddon Hall
McQuilkin, H. P., Asst. P. A., B. & O., Haddon Hall
McTyre, G. A., Stk., C. & O., Ambassador
Mello, A. J., P. A., P. F. E., Traymore
Mellon, H. N., Com. Buy., Penna., Knickerbocker
Merritt, W. H., Trav. Stk., B. & M., Haddon Hall
Miller, J. V., Asst. Gen. Stk., C. M. St. P. & P., Knickerbocker
Mills, O. B., Asst. Gen. Stk., Penna., Chalfonte
Monroe, E. T., Asst. P. A., B. R. & P., Stevenson
Morehead, W. S., Asst. Gen. Stk., I. C., Shelburne
Morisse, R. R., Div. Stk., Nor. Pac., Haddon Hall
Morris, H M., Asst. P. A., W. & L. E., Ambassador
Morris, W. H., G. S., Reading, Strand
Morris, W. W., Asst. P. A., Penna., Ritz
Morrison, I. C., Stk., C. B. & Q., Craig Hall
Mullens, A. R., Div. Stk., U. P., Shelburne
Munster, A. W., P. A., B. & M., Chalfonte
Murphy, F. A., Dist. Stk., B. & O., Knickerbocker
Murphy, J. P., Stores Asst. to Mgr. P. & S., N. Y. C., Traymore
Murrin, C. rt., Spec. Acct., I. C., Strand
Myers, E. J., Gen. Stk., Nor. Pac., Haddon Hall
Nainie, H. M., Asst. to Pur. Agt., B. & M., Chalfonte
Nelson, A. R., Gen. Cl., A. T. & S. F.
Nelson, O., Gen. Stk., U. P., Traymore
Neph, J., Div. Stk., So. Pac., Strand
New, G. W., Trav. Stk., I. G. N. G. C. L., Strand
Newman, F. C., Stk., Sou., Colton Manor
Nickoles, J. C., Gen. Stk., N. Y. C. & St. L., Ambassador
Norris, E. E., Div. Stk., S. P. L. & T., Strand
O'Connor, W. J., G. S., I. R. T.
Oeschger, C E., Ch. Cl. Store Dept., C. M. St. P. & P., Knickerbocker
Oldenbuttel, N. V., Asst. Gen. Stk., A. C. L., Haddon Hall
O'Meara, B. H., Div. Stk., Mo. Pac., Shelburne
Orndorff, J. R., Supvr. of Mat., B. & O.
Oswald, W. L., Asst. G. S., Penna., Elberon
Pace, R. T., P. A., A. & W. P. G., Brighton
Painter, C. R., Asst. to V. P., N. Y., N. H. & H., Traymore
Pearce, H. C., Dir. of Pur., C. & O., Haddon Hall
Peery, H. R., Div. Stk., C. St. P. M. & O.
Peterson, Edwin W., G. S. B. & A., Haddon Hotel
Phebus, D. H., Insp. of Stores, C. M. St. P. & P., Knickerbocker
Phillips, John P. H., Req. Marker, Penna., Penn Atlantic
Plank, V. R., Sta. Stk., S. P., Ambassador
Plechner, F. I., P. A., Gt. Nor., Shelburne
Polk, E. H., Dist. Stk., S. P., Ambassador
Prentice, A. L., Supr. of Scrap & Recl., N. Y. C., Ritz
Presten, C. F., Gen. Stk., C. V., Haddon Hall
Rainey, William T, Asst. Treas., Cons. R. R. of Cuba, Marlborough
Ralls, H. C., Dist. Stk., M. P., Strand
J. G. Ranshenberger, Mgr. of Equip. Acct., G. & E. I., Belmont
Reed, D. H., Trav. Stk., Sou., Colton Manor
Reeder, W. W., Gen. For. Sup. Dept., M. P., Strand
Reynolds, F. W., Dist. Stk., B. & O., Shelburne
Riday, W. C., Sec. in chg. of Pur., N. & P. B. L., Santa Rita
Riley, A., Asst. P. A., O. & W., Princess
Roberts, B. W., Asst. Gen. P. A., C. P. R., Haddon Hall
Roberts, C. S., Div. Stk., I. C., Strand
Roberts, E. G., Div. Stk., C. R. I. & P., Strand
Robinson, I. S., Stk., A. C. L., Haddon Hall
Rock, D. E., stk., P. R. R., Grand Atlantic
Rodgers, Chas. J., Stk., D. L. & W., Osborne
Rothgery, C. H., Div. Stk., B. & O., Jefferson
Ruston, W .E., Asst. Gen. Stk., B. & M., Haddon Hall
Rutherford, A. B., Stationer, U. P., Ambassador
Ryall, R. H., Stk., G. T. W., Strand
Sanders, Geo. A., Div. Stk., C. R. I. & P., Penn Atlantic
Sanford, W. F., Dis. Stk., C. & N. W., Haddon Hall
Satchell, N. L., Stk., N. Y. O. & W., Haddon Hall
Savage, T., Asst. to Mgr. of Pur., Erie, Ritz-Carlton
Schenkel, J. T., Div. Acct., W. & L. E., Haddon Hall
Schneider, Jos. J., P. A., Mer. Desp., Chalfonte
Schrader, A., Insp., Penna.
Schrader, F. L., Asst. to Sr. V. P., C. & I. M., Haddon Hall
Schultz, Frank, Stk., Penna., Grand Atlantic
Scott, G. W., Dis. Stk., M. K. T., Ritz
Scott, Geo. E., P. A., M. K. T., Traymore
Scott, Sam, Natl. Insp., C. & O.
Seibel, Wm., Stk., C. R. R. of N. J., Hanover
Seith, Harry, Stk., N. Y. C. & St. L., Knickerbocker
Seyfarth, E. E., Stk., B. Ry. of Chic., Colton Manor
Shanks, H. T., P. A., L. & N., Marlborough
Shepherd, R. M., Asst. to Pres., N. Y. C. & St. L., Marlboro
Shimer, F. B., Asst. Stk., N. Y. O. & W., Haddon Hall
Shine, W. B., Stk., Texas, Strand

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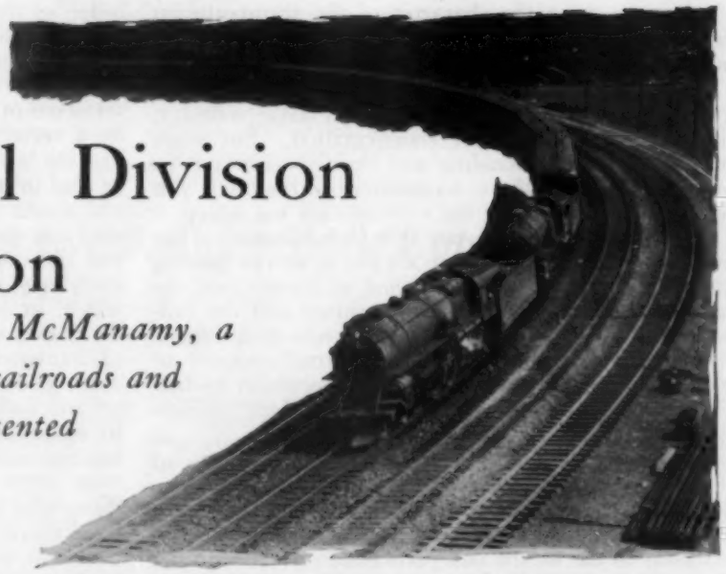
Second Mechanical Division Session



Address by Honorable Frank McManamy, a paper on power plants for railroads and two reports are presented

YESTERDAY morning's meeting of the Mechanical Division was called to order by Chairman Smart at 9:30, and after announcements of the day by Secretary Hawthorne, the Honorable Frank McManamy, member of the Interstate Commerce Commission, was introduced by the chairman.

Address by Commissioner McManamy

An important function of the association is that of a lawmaker———other forms of transportation will not affect long distance haulage

About sixty years ago the members of the mechanical departments of the American railroads realized that if we were to build up a satisfactory transportation system for this great and growing country, and if the transportation was to be carried on without loss of delay and inconvenience, something had to be done to facilitate the interchange of equipment.

This association had been in existence for many years before all the railroads in the country were willing to let all of their own cars go off their own line, but this organization took the first step in that direction, and foresaw the necessity of preparing rules under which traffic could move from coast to coast without being transferred from one car to another. This association has also functioned in an important way as a lawmaker. That may surprise you, but nevertheless, under the Interstate Commerce Act, the rules of this association act with the force of law. We have the rules of interchange which must be observed by the carriers, the rules governing the safe transportation of explosives, the loading rules, demurrage rules, car hire rules, inspection rules, both locomotives and cars under which the three and one-half million cars are moved from point to point.

All of these rules govern the movement of transportation, and therefore must be just and reasonable. That means, fair to each other and fair to the public, and I can point to recent instances where, if they are not fair and reasonable to all parties, they will be reviewed by the Interstate Commerce Commission under the Act.

In other words, you have got to treat your neighbor fairly. The large carrier cannot take advantage of the small carrier, nor can the small carrier escape its obligations to the larger carrier. Therefore, this association has an important function to perform in the capacity of a law maker.

Another matter that I want to touch on briefly is my position with respect to these conventions. I have been asked frequently what the commission thought about these conventions, and how they felt with respect to the exhibits which are here.

The Interstate Commerce Commission speaks only through formal order. No individual can speak for it. But so far as I am concerned, the experience which I have just related and the fact that for 29 years I have never missed a convention which I could possibly attend, indicates my position with respect to them.

We have, in this joint convention, the most wonderful exhibit that it has ever been my pleasure to attend. We have railway appliances of all kinds. We have indications that the men who are furnishing the supplies for the transportation industry and who are responsible for this exhibit are not overlooking the possible future development of transportation. That is made very evident by the remarkable exhibit of motor coaches and other instrumentalities of motor transportation.

We hear a great deal concerning the possibilities, the probabilities or the actualities of railroad transportation decreasing in certain respects. That is true; but that is not an unmixed evil. As a matter of fact, it has been well-known by the men who were figuring the costs of transportation for a number of years that much of the traffic which is now going to motor coaches is not a profitable traffic. Short-distance passenger business, local freight business, when you come to figuring the cost of two terminal services and a very short line haul, have for many years been performing with little or no profit.

If that should, in the development of the transportation industry, go to some other means of transportation, we still have before us the very real need of the country for the long-distance, the long-haul service of the railroad, and when we consider the fact that within the last year, for the first time in the history of the railroads, our car-loadings exceed a million per week, I don't think we have so much to worry about.

We may change the character of the transportation slightly, but we will not change the need for the present means of handling it for many, many years, if ever.

It would be a rash individual who would attempt to say what would happen in the transportation industry, with aeroplanes and motor transportation. But when you go down to the Reading and Pennsylvania stations and look at some of those locomotives on the track, you will begin to realize that the railroads are not asleep.

When you consider the fact that such locomotives are being developed, and that they are put in service hauling heavier trains at higher speeds and at lower costs, the manufacturers who build those machines and the railroads who buy them and the designers who design them, whether they are employed by the railroad company or locomotive builder, haven't very much occasion to fear any other means of transportation taking their business away from them, for a while.

I hope every member here will take advantage of whatever opportunity he may have to add something to the general knowledge of this convention. Don't forget that you benefit from a meeting of this kind in direct ratio to the extent you participate. If you do not take part you are losing something. The convention is losing something, too, because each of you have ideas that will be helpful here. But you are the big loser.

We have now coming before the Commission matters relating to equipment to consider that never before came before us. Under the law, our decisions must be based on the record made. But there is not anything in the law that prevents a man from getting as much first-hand information concerning these devices as he can get, and that is one of the things that I am going to try to do, and from the activity I have observed so far, the railroad people here are going to do the same thing.

I referred to the various rules and regulations of this Association which, as a matter of fact, either have the force of law of themselves, because the law provides that all the rules, regulations and practices must be just and reasonable, but some of them have, by order of the Commission, been actually made the law.

In the early days we did not sit down around the table and thresh out our difficulties, as we do today. In fact, the first convention which I attended as a representative of the government, I asked for consideration by a certain committee of matters which we believed that the law required, and we were told that they would be glad to talk to us but that their report was made out and would not be changed. We do not do things that way any more. We find that the desire to co-operate and the need for co-operation has been recognized by everybody, and we realize that this transportation system which, in what we call the Dayton-Goose Creek case, the Supreme Court has described as a national system of transportation, can be worked out better by sitting down and reasoning together than it can by standing off and making faces at each other. That sort of thing, to whatever degree it ever existed, has gone out of business and we are all glad of it and all better for it.

In other words, the spirit of co-operation between those who are required by law to exercise certain authority over the transportation system and those whose duty it is to see that the transportation system is made to function as economically and efficiently and safely as possible, has increased to the extent that we have little or no trouble. But there is one point that I think we ought to all remember. Co-operation is born a twin. It won't thrive alone. Both sides must sincerely desire and endeavor to co-operate if we are going to have the success which we ought to have and to continue even to have the success which we are now having.

I am sure that you are going to have one of the most successful conventions that you have ever had. The work is growing, becoming more important; the industry is growing, you have greater facilities and greater opportunities, and from my long acquaintance with the railroad men of the country I know that they will not fail to take advantage of the facilities and the opportunities to the end that they can improve the means of transportation.

Santa Fe Moving Picture Showing Operation of Steam Locomotive

John Purcell (Co. A. T. C. S. F.): The animated pictures that we are going to show were prepared for educational purposes. They have been shown to several thousand employees on our own line and a great many other railroad men have seen them besides the boys of the Santa Fe. We also have another reel on the thermal

Table I. Typical Operating Conditions, Gasoline, Distillate and Diesel Electric Rail Cars

See Report on Opposite Page

	Miles	Station distance miles	Train weight tons	Rated engine power	Average speed m. p. h.	Average output kw	Average engine hp	Max. engine output hp	Average kw per ton	Average miles per gal.	Ton-miles per gal.	Kw-hours per gal.	Watt-hours per ton mile	Average hp = per cent. rated hp
Diesel	307	6.1	82.8	300	29.5	102	147	415	1.25	2.21	259	9.0	35.0	49.0
														38.2
	218	7.1	136.0	320	33.0	118	170	275	.87	2.16	259	7.7	30.0	53.0
														29.8
	18.8	2.1	71.5	120	26.0	40.5	58.5	99.5	.57	1.40	87	2.2	25.0	48.8
Gasoline	61.6	3.6	55.0	250	25.8	76.6	114	244	1.39	....	....	....	55.0	45.6
	150	5.3	55.0	250	36.9	94.5	141	229	1.72	1.57	86	4.0	46.0	56.4
	149	3.7	55.0	250	33.3	91.4	136	240	1.66	1.45	80	3.8	48.0	54.6
	86.6	4.8	55.0	250	35.8	92.7	138	225	1.69	1.79	99	4.8	47.0	55.1
	244	7.6	55.0	250	37.4	90.8	136	233	1.65	1.84	102	4.5	44.0	54.6
	37.6	2.5	55.0	250	27.2	80.3	120	229	1.46	2.00	110	5.8	53.0	48.0
	106	3.9	55.0	250	29.0	78.7	118	238	1.43	2.05	113	5.5	49.0	47.1
	137	4.3	55.0	250	33.8	91.7	137	259	1.67	1.69	93	4.8	52.0	54.7
	122	3.8	96.7	250	35.7	127.0	189	201	1.31	1.57	150	6.1	41.0	75.5
	122	4.2	96.5	250	33.4	108.0	162	186	1.12	1.46	141	5.3	38.0	64.4
	228	4.1	101.0	250	36.3	123.0	184	211	1.21	1.79	180	6.8	38.0	73.5
	228	4.0	99.2	250	33.6	126.0	188	214	1.26	1.39	137	5.8	42.0	75.5
	186	3.5	94.7	250	30.0	102.0	153	173	1.07	1.76	166	6.7	40.0	61.4
Distillate	135	7.3	68.7	225	26.7	.....	.....	.....	....	2.0	137	....	....	....
	225	7.2	111.0	275	24.1	.....	.....	.....	....	1.5	166	....	....	....
	225	7.2	85.5	275	26.4	.....	.....	.....	....	1.5	128	....	....	....
	68	5.7	75.7	225	29.0	.....	.....	.....	....	1.9	142	....	....	....
	68	5.7	77.6	225	29.0	.....	.....	.....	....	1.7	130	....	....	....
	95	6.3	81.9	225	27.7	.....	.....	.....	....	1.9	156	....	....	....
	132	6.6	113.0	225	25.3	.....	.....	.....	....	1.9	205	....	....	....

operation of the locomotive. If these pictures go over, possibly at the next meeting we will show you the complete workings of an air compressor, a triple valve and brake valve, showing the travel of the air from atmosphere to atmosphere.

Vote of Thanks

(The two Sante Fe pictures were then shown on the screen after which Mr. Purcell was given a rising vote of thanks—Editor.)

Report of Automotive Rolling Stock Committee

Initial operating problems satisfactorily dealt with———Investigation of other fuels desirable

C. E. Brooks
Chairman

It will be noted that our 1927 report was of a general nature and merely indicated the trend of development. The statistics which we were able to secure from member lines indicated in particular that the general trend was toward the use of electric transmission and present information confirms that this condition continues and consequently our report is confined to equipment using the electric form of drive.

During 1927 the Motor Transport Division of the A. R. A. was organized, with a scope of activities which includes motor rail cars and in order that there might be the greatest measure of co-operation between this division and the Sub-Committee of the Mechanical Division, representatives of the Motor Transport Division have been invited to attend our Sub-Committee meetings. It has been suggested that the best results can be obtained by joint efforts in the consideration of mechanical matters pertaining to all motor equipment, whether operated on rails or highway, and mention is made of this so that some definite arrangements can be made to this end before our next report is submitted.

As indicated in our 1927 report, we consider that the sub-committee could be of the greatest service to the membership by concentrating on a particular branch of motor rail car development and, therefore, we have confined this report to the power equipment, including the engine, the transmission equipment and the all important questions of reliability and serviceability. In this study we have secured information with regard to those parts which have given trouble and which, therefore, are effecting the maximum use of the motor equipment. As a result of this presentation it may appear to some that there is an undue amount of trouble with motor equipment and that the desired amount of progress is not being made. This sub-committee submits that such is not the case and that accurate information gathered from representative sources indicates good progress being made in the use of the entire power plant and electric transmission equipment and we believe that a careful study by the Mechanical Division and by the manufacturers will lead to a greater measure of co-operation and to even better results.

It has been suggested that general specifications covering various sizes of power plants could be drawn up for the guidance of the railways, but at this time we do not feel that this would be advisable, although it may be of great benefit in the future. At the present time rail car equipment is in a state of development and flux, and changes and improvements are constantly being made. It is felt that any attempt to draw up general specifications of equipment would tend to limit and retard development with no compensating benefit to the railroads.

We are, therefore, confining the scope of this paper to a consideration of the details mentioned previously, calling particular attention to the fact that reference is made to the use of gasoline, distillate and fuel oil. At the present time there are certain inherent advantages in the use of each kind of fuel, all of which should be given study by users of automotive equipment. We submit that information indicates good progress is being made in the use of both distillate and fuel oil and call attention to the possibilities in economy with these lower grade fuels.

Operating Conditions

Table I gives a summary of operating data for representative runs of gasoline, distillate, and Diesel rail cars.

Serviceability

The serviceability of motor rail cars compares favorably with steam power and approaches the standards set by straight electrical equipment. While the statistics in Table II are representative of current conditions, it should be noted that lack of experience on the part of shop personnel and maintenance forces, insufficient supplies of repair parts, and the necessity of making or applying certain design changes has tended to augument the number of days spent in the shop. This effect is partially, though not wholly offset by the fact that, due to the newness of most of the equipment, relatively few general overhaul jobs are covered by these statistics.

Attention is called to the fact that rail car equipment can be kept almost continuously at a high standard by replacement of minor parts when worn and that heavy rebuilding, as in the case of steam locomotives where the replacement of many major parts may be required, has no parallel in rail car operation.

Table III—Reliability

		Due to engine		Due to other power equipment	
		Mi. per delay	Mi. per total failure	Mi. per delay	Mi. per total failure
Diesel	A	14,200	21,300	12,300	29,200
	B	44,312	310,184	12,984	77,546
	C	219,564	219,564	109,782	219,564
Gasoline	D	57,100	85,700	.....	85,700
	E	31,800	63,600	22,400	51,800
	F	18,600	11,600	16,000	24,000
	G	00,000	00,000	00,000	00,000

Reliability

Table III gives representative statistics showing the miles per delay of five minutes or more, and the miles operated per total failure. Practices for recording such data vary somewhat between different railroads so that these values are not necessarily strictly comparable. An analysis of the distribution of causes for engine failure between certain of the major units is given in Table IV. A considerable majority of the delays experienced seem to be chargeable to accessories and auxiliary equipment rather than to the engine proper.

It is decidedly gratifying to note from this information that the engines now in general use in rail cars are relatively free from inherent structural weaknesses. Many of the causes of the failures above recorded have since been corrected so that we may expect a continued improvement and, ultimately, very high standards of reliability.

	Number of failures	Per Cent
Crankshaft	0	0
Bearings	7	5.9
Lubrication	9	7.6
Connecting rods	7	5.9
Pistons	4	3.4
Piston rings	0	0
Cylinders	1	.8
Cylinder heads	13	11.0
Valves	9	7.6
Valve mechanism	10	8.5
Cooling system	14	11.9
Fuel system	13	11.1
Ignition	3	2.6
Control	28	23.7
Total	118	100.0

Table II. Serviceability

	Gasoline						Distillate	Diesel
	A	B	C	D	E	F	G	H
Percent unserviceable due to engine	3.4	15.0	....	1.9	3.2	....	....	16.7
Percent unserviceable due to other power equipment	3.2	11.6	....	0.4	3.9	....	....	4.2
Percent serviceability complete power plant	93.4	73.4	83.6	97.7	92.9	84.7	93.7	79.1

Discussion of Engine Problems

Crankshafts—Breakage of crankshafts is practically eliminated and causes no concern. Wear of crankpin bearings, while not excessive, contributes substantially to engine maintenance expense. Table V has been submitted as an index of this condition.

Bearings—Wrist-pin bearings have given no trouble except in isolated cases when improper fitting was responsible for incorrect clearances and alignment.

Connecting rod big end bearings are reported as running 60,000 to 100,000 miles before tightening or replacement. After long use there are frequent occurrences of cracking of the bearing metal and separation from the bronze shell. This characteristic was especially noticeable in the case of certain experimental bearings in which steel shells were used, in which case failure

Table V—Wear of Crankpins

A .007 in. to .009 in. out of round in 95,000 mlies.
B .004 in. to .009 in. wear in 100,000 miles,
.002 in. to .003 in. out of round in 100,000 mil.es.
C .002 in. to .004 in. wear in 60,000 miles.

usually occurred at about one-third of normal mileage and resulted in scoring of the crankpin. Small bolts or excessive strain on nuts contribute to these difficulties. It is appreciated that, in addition to proper lubrication, it is essential that bearing shells be very carefully fitted into the rod ends and caps, that the caps must be tightly fitted and bolted to the rods, and that the crank and wrist-pin bearings be strictly parallel.

Main crankshaft bearings are practically free from trouble except in the case of failure of the lubricating system or of the retaining dowel.

Camshaft and timing gear bearings have in several cases given trouble by seizing and wearing prematurely. This seems to have been caused in some cases by misalignment, insufficient lubrication, and inadequate fastening and support of the bushings.

Lubrication—Complete lubrication is the determining factor in fixing the overhaul costs and the ultimate life of rail car power plants. Proper lubrication comprises:

(a) An oil of the proper physical and chemical characteristics.

(b) Maintaining a film of this lubricant intact at all times at points of potential wear.

(c) Maintaining integrity of the lubricant by excluding or removing foreign matter such as diluents, sludge, abrasives and corrosives.

The obstacles to the realization of these conditions are numerous. An oil viscous enough to protect a hot engine under heavy load may circulate so slowly through a stone cold system as to permit excessive wear before proper lubrication is fully established and vice versa. This condition is being met by pre-heating the engine by means of the car heating system, by by-passing the radiators or otherwise accelerating the warming up process. Conversely, if oil coolers are used to lower the maximum temperature of the lubricant, a lighter oil may be found to give satisfaction. Some operators have found that the indication of the oil pressure gage on a cold engine might be entirely misleading due to improper location on the gage line, which showed pressure at the pump rather than at the most remote bearing. The early access of oil to other parts than crankshaft and cylinder walls is found to be of importance because many of the cam and valve mechanism and accessory drive bearings are not readily tightened and the accumulated wear of these parts contributes in the long run to high maintenance charges or the gradual disintegration of the power plant.

Whatever the characteristics of the oil as originally supplied to the engine, these immediately begin to undergo changes in use, not, in the case of high-grade oils, because of any appreciable breaking down of the oil itself, but because of the admixture of unburned fuel and the products of combustion. In gasoline engines, especially while warming up, a certain proportion of the heavier fuel fractions work past the piston and dilute the lubricant. Fortunately in rail car service the operating temperatures are usually high enough to prevent the accumulation of more than 15 per cent of diluent. Furthermore, this diluent does no particular damage other than thinning down the oil from its original consistency; but because oils are used longer in the diluted than in the pure condition this necessitates allowing for dilution in the original specification of the oil and a resultant excess of viscosity immediately following the filling of the crankcase or oil tank.

Dilution is a much more serious problem when distillate fuel is being burned. In this case, the fuel fractions are so heavy and accumulate so rapidly that instead of stabilizing in the neighborhood of 15 per cent as in the gasoline engine, dilution reaches 40 to 50 per cent within a few hundred miles of operation and would apparently continue to increase indefinitely. At this point, however, even though an extremely heavy oil is originally supplied, the viscosity of the mixture becomes so low as to require draining and refilling of the system. As an example of this practice, it may be mentioned that although the oils usually used in gasoline engines for rail car service have a viscosity of about 75 seconds Saybolt at 210 deg. F. and are run with a crankcase temperature of approximately 140 deg., it has been found advisable when using distillate fuel to use oils which had an initial viscosity when new of 115 seconds Saybolt at 210 deg. and to cool these oils while running to 100 deg. F. or as near that temperature as possible. Dilution does not appear to an appreciable extent in Diesel engine lubricants. Rapid wear of piston rings and the upper end cylinder walls is apt to accompany excessive dilution for it is at these points that the diluent is present in the largest proportions.

Carbon in the crankcase appears to come from two sources and to be of two varieties. Some results from the carbonizing of oil on the lower side of a hot piston head with the formation of hard grains or flakes, while some forms as smoke due to incomplete combustion inside the cylinder and a portion of this finds its way past the piston into the crankcase. The former variety is relatively coarse and may be removed by filters connected to the lubricating system. The latter is extremely fine, tends to remain in suspension and is not readily removed by filtering. It is more noticeable in Diesel engines than in other types. This carbon tends to clog piston rings, which in turn aggravates the rate of collection. In the presence of water, coming either from cooling system leakage or condensation of the products of combustion, carbon forms a slimy sludge which tends to clog screens, filters and in some severe cases even oil passages.

The presence of abrasives may be minimized by careful handling of oil prior to putting it in the engine, rigid cleanliness when working upon the engine, and suitable location or shielding of the engine air intake.

Corrosion of steel parts such as bearing surfaces and cam faces results from surphur acids in the crankcase. These acids are not present in new oils but form rapidly from the combustion products of high sulphur fuels if these are allowed to condense in the crankcase. High running temperatures and ample ventilation through crankcase and valve chambers will remove these products as vapors and minimize their harmful effects.

Pistons—Pistons occasionally give trouble due to breakage through the ring grooves for reasons not thoroughly understood but very likely due to insufficient metal, too small clearance on the upper lands, or carbonizing in the ring grooves. Piston wear is not appreciable except for widening of the upper ring grooves. In some cases growth of the aluminum alloy pistons results in actual increase of size with use. Piston clearances have an important effect on oil consumption, particularly when idling a cold engine. Split skirt constant clearance pistons appear to alleviate this condition though in some cases they have been found lacking in strength.

Ring groove clearance in a gasoline engine using aluminum alloy pistons is reported as follows after 75,000 miles operation:

Top groove	.010	.012	.010	.012	.010	.012
Second groove	.002	.004	.006	.005	.003	.005
Third groove	.003	.004	.003	.003	.003	.002
Fourth groove	.003	.003	.003	.003	.003	.003

These rings when new presumably had about .002 clearance.

Piston Rings—Carbon formation in ring grooves results in stuck and broken rings and consequent rapid cylinder wear, oil pumping and oil contamination. With the exception of engines burning distillate, ring wear does not seem to be important, the chief wear occuring in the sides of the groove as mentioned in the preceding paragraph. Excessive groove clearance accentuates oil pumping. Various types of special oil control rings are being tried out with varying degrees of success, in reducing oil consumption and preventing the fouling of spark plugs. Rings appear to have a life of 75,000 to 100,000 mi. or more unless they are allowed to become stuck or broken.

Cylinder Sleeves—Data on cylinder wear are incomplete and sometimes contradictory. Many sleeves have been replaced or reground at 25,000 to 60,000-mi. intervals while others have given satisfactory service for 100,000 to 160,000 mi. Normal average wear in 8¼-in. Diesel cylinders is reported as .010 in. in 100,000 mi., which may be increased to as much as .015 in. in 25,000 mi. if the rings become blocked with carbon. In a 7¼-in. gasoline engine, without oil filter and changing oil every 2,200 mi. the wear at the bottom of the sleeves was about .002 in. and at the top averaged .008 in. parallel to the shaft and .012 in. transversely, after 75,000 mi. of service.

Rubber seal rings at the joint between the cylinder sleeve and the water jacket have given trouble on several roads and on different makes of engines. Leaks develop at this point which require the removal of cylinder heads, pistons and cylinder sleeves in order to permit the application of new seal rings. It is suggested that rings of better quality might be developed, that two or more rings per cylinder can be used to advantage,

or that a gland ring might be provided to permit the changing of rings without dismantling the engine. One engine equipped with triple rings is the only type reported as being free from leakage difficulties.

Although not as yet resulting in the actual failure of cylinder sleeves, pitting of the outer surface by electrolytic action of the cooling water has in some cases progressed to a depth of ⅛ in. and steps to minimize this action are in order. One road has found that the addition of about 3 oz. potassium bichromate to 100 gal. of cooling water appears to stop such pitting and to prevent the formation of rusty sludge and the plugging of water passages.

Cylinder Heads—The failure of cylinder heads has been more generally experienced than any other single trouble and, as those are expensive units, the cost of replacement has been high. The usual form of failure is a crack in the casting between the valve ports, usually between the two exhausts, where a large amount of heat is present and where water circulation is least likely to be positive and copious. This condition may be aggravated by piping systems which do not provide for water circulation at low speed or after stopping a hot engine, by operating with low water, or by the use of excessive amounts of alcohol or other anti-freeze compounds, and the use of manifold exhaust pipes and high back pressure in mufflers.

Progress has been made in the training of personnel, eliminating air and steam pockets, changing the material of the head and thoroughly annealing the castings, increasing water pump capacity and securing free flow of water at all times, including provision for thermosyphon action. Lack of sufficient pump capacity to maintain water circulation at idling speeds appears to have been responsible for a certain proportion of cylinder head failures.

Excessive wearing away of valve seats due to softness of the material or to continue reseating eventually causes scrapping of the head. Some progress has been made with the insertion of replacement seats though this has not yet been carried far enough to give conclusive results.

Valves—Occasional cases of sticky valves have been reported. In one case this seems to have been due to the particular brand of commercial gasoline used, as the trouble ceased upon changing to another brand. Others have found sticking to be caused by too long valve guides with excessive space for the formation of carbon. The remedy suggested for this is to use hard bronze guides, cut off nearly flush with the wall of the port, and having a minimum of clearance on the valve stem. Other valve troubles have been due to improper adjustment of the tappet clearances or to inaccurate seating. Twenty thousand to 25,000 miles is considered good average service between valve grindings.

Minor but annoying difficulties have been experienced with valve stem caps and tappet adjustments, indicating that improvements may be looked forward to along these lines.

Cooling System—Strong sentiment is shown toward the roof type of radiator and, where possible, elimination of air circulating fans. Means for cutting out portions of the radiating surface are considered desirable and all outside water passages should be made self-draining into a reserve water tank inside of the car. Thermostatically controlled by-pass connections are looked upon with favor provided that a sufficient mass of water is kept in circulation to prevent too rapid changes in temperature. Control valves should, in general, have drilled gates or discs to permit of drainage and the equalization of temperatures.

Provision for keeping the engine and circulating water warm during layover periods, either by direct interconnection with the car heating system or through the use of special heating coils is desirable as a means of preventing freezing and improving lubrication conditions. Such connections should be so arranged that no damage can be caused by carelessness or neglect of the operator.

Fuel System—General dissatisfaction is shown with vacuum type systems, due both to the difficulty of keeping lines tight and to insufficiently rugged construction of float and valve mechanisms. Pressure feed systems, though reliable, involve a fire risk in the case of accident. Efforts are, therefore, being made to find satisfactory substitutes for these and encouraging reports are made on vane and gear type pumps driven by small electric motors and on special types of pumps driven from the main engine. One road is insuring reliability by adding an entirely distinct system for emergency or stand-by service, using groups of electro-magnetically operated syphon pumps.

Fine mesh fuel strainers of ample capacity are strongly recommended, though some trouble has been experienced with the clogging of very fine gauze and of chamois strainers. Dirt or water in gasoline or fuel oil lines are responsible for a considerable proportion of delays and it is apparent that too much care cannot be exercised in the handling and storage of fuel, to eliminate all foreign substances.

The chief mechanical difference between the Diesel and other engines lies in the fuel injection pumps and questions regarding the life, reliability and maintenance costs of either air or solid injection systems in railroad service have often been raised. The following information regarding injection pumps is, therefore, of particular interest. Main fuel pumps fail due to scoring of the plungers, wear, and very occasionally, seizing. The average mileage of a fuel pump is now 50,000 mi. before any attention is required. The bushings may then need renewing. About six cases of trouble due to lack of adjustment of ball check and relief valves have been reported, but these were all due to ignorance and should not occur again.

Ignition—With the exception of one railroad which reports excessive trouble with magnetos, ignition complaints are limited to minor spark plug troubles.

Man Failures—Many failures, of more or less serious nature, are due to frequent changing of crews and insufficient time given to the instruction of new men. While the changing of crews presumably cannot be avoided, the short sightedness and false economy of entrusting expensive equipment to men who have received insufficient instruction and who have not demonstrated a satisfactory knowledge of their equipment and the proper method of handling it under all conditions, is becoming recognized and on several railroads the instruction of operators and maintenance forces has been made a major part of the rail car program.

Summary—The information above submitted leads your subcommittee to the belief that serious failures of important engine parts have been reduced to a point where they cause no further serious concern but indicate that some attention should be paid to the details of auxiliary apparatus and to the establishing of improved shop practices which will serve to detect and remedy other insipient causes of trouble before they result in failures. By so doing, the availability of equipment and its reliability in service will be maintained at a maximum.

Recommendations—This sub-committee feels that as the initial problems of rail car operation have to a large extent been satisfactorily met, the problem of securing rail car service at a minimum of operating cost is one to which we can now give a large proportion of our attention and it is recommended that studies during the coming year be devoted largely to an investigation of the relative advantages of different fuels, the probable development in the availability of such fuels in the future and the technique of burning the fuel satisfactorily in internal combustion engines.

The report was signed by C. E. Brooks, (chairman), chief of motive power, Canadian National; B. N. Lewis, mechanical superintendent, Minneapolis, St. Paul & Sault Ste. Marie; F. P. Pfahler, assistant to chief of motive power, Seaboard Air Line; F. K. Fildes, assistant engineer, Pennsylvania; A. H. Fetters, mechanical engineer, Union Pacific and D. L. Bacon, supervisor of automotive equipment, New York, New Haven & Hartford.

Discussion

In presenting the report, the chairman gave out the following information which had not been included in the report:

C. E. Brooks (C. N.): Recently there has been a marked trend on the part of the gasoline-engine manufacturers to prepare their equipment so that it would use distillate. A great deal is being made of that point and is being used as an argument against the development of the oil engine. For that reason we have made some investigation with a large oil company of which I have asked four questions. These have been answered by the company.

First—With the development of the modern refining processes, will there be any probable scarcity of distillate, so-called, or of light fuel oils 30 deg. to 34 deg. Baume?

Answer: Yes.

Second—If so, which will be used first, the distillates or the fuel oils, in refining processes?

Answer: Distillates.

This question was asked for the purpose of determining whether, in the modern cracking processes, distillates would disappear from the market first and be converted into the high volatile fuels such as gasoline, or whether fuel oils would disappear first.

Third—Will there always be a supply, by product or residual, of fuel oil?

Answer: There will be residual, but it will be low in gravity.

This answer means the residual will be lower in

gravity than what is at present termed light fuel oil, which is 30 to 34 deg. Baume. This would indicate that we could expect, with development of refining processes, to have to use fuel oils down around 24 to 28 deg. Baume.

Fourth—Will there be any advantage in price in figuring on using heavy fuel oils in oil engines?

Answer: Yes, between three and four cents per gallon in favor of heavy fuel.

N. W. Storer (Westinghouse Electric & Mfg. Co.): The last item in Table 4 is an analysis of engine trouble. "Control" is listed as having 23.7 per cent of all the mechanical failures. I would like an explanation as to whether those control troubles refer to the engine or to the electrical equipment.

Mr. Brooks: Those failures refer to the hitch-up of the electrical equipment and the power unit and the controlling thereof through the controller and the ordinary equipment which goes along with the various types of gas-electric or oil-electric equipment. Many of the cases of failure in control equipment has been due entirely to ignorance on the part of the operator in locating such a thing as a fuse.

A. H. Candee, (Westinghouse Electric & Manufacturing Co.): I would suggest that the committee this coming year give some thought to the standardization of parts that enter into the power equipment of oil or gasoline-electric rail cars. This would assist in reducing the cost to the railroads. We know that, out of perhaps fifteen different types of engines, some will operate clock-wise, and some counter clock-wise. On some of the engines, the feet of the generator are on a plane with the center line of the crankshaft and others are on a different plane. We find that on engine ratings, some of them will be rated up to the very maximum and some will be rated up ten per cent below the maximum and some will be rated up 25 per cent below the maximum. There are a great many other matters such as axle sizes. We find that invariably we run rather heavy on the axles. We believe that the automotive rail car can operate with a smaller axle than the steam equipment or electric railway equipment.

Mr. Brooks: The committee will do everything to bring about that highly desired condition. But, like all other railroad efforts, the first thing we bump up against in standardization is the manufacturer, particularly the electrical manufacturer. We will experience this condition just the same as we do with cars or equipment of any kind, and that is where one manufacturer will tell a certain railroad that the standard he has is infinitely better than the other. It is going to be a most difficult thing to do. There are only a few things I believe that you could standardize and the axle size is a good place to begin.

G. S. Goodwin (C. R. I. & P.): We have about 13 motor cars in service on the Rock Island and are buying 14 more cars this year. Some of those cars are straight motor cars, some will have double power plants so that we can use them as a locomotive, and haul one or more trailers. We are figuring on handling some of our local passenger trains, two or three cars, with these double-engine power plants.

We have the least trouble with motor cars where the man in charge, generally the master mechanic, takes the greatest interest in the motor car, and where he has the most rigid inspection. We do not try to make too much mileage with the oil. Our practice is to change our oil every 500 miles.

W. L. Bean (N. Y., N. H. & H.): The New Haven road has 36 rail motor cars. Considering them in connection with the suggestion of standardization, our experience has been that before we really got a new order of cars broken in, they were not big enough. This demand has been progressively that way. I do not see that there is a whole lot of opportunity for standardization while the state of the art is progressing as rapidly as it has been.

It appears that some advantage lies in the use of distillate and that fuel economy is obtained thereby.

The problem of heating at layover points is particularly difficult to handle, especially on a road where the change in operating condition in respect to the use of self-propelled cars is in a state of flux to such an extent that we are confronted on one hand with the necessity of heating to prevent freezing and heating to assist in lubricating conditions and at the same time considerable money is spent for facilities only to find that a change in operating requirements moves the cars elsewhere. This leaves a facility that is of no use.

A. H. Fetters (Union Pacific): The Union Pacific built its first McKeen railway gasoline motor car 25 years ago. It was a four-wheel car, and it was driven by a six-cylinder yacht engine with make-and break ignition. It was a very crude engine and a very crude car, but it served its purpose in giving us certain fundamental information upon which the successful McKeen cars were afterwards designed and built. Upwards of 130 of those cars were con-

Locomotives at Union Terminal, Jacksonville, Fla.

structed and put out on various lines of the Union Pacific System, Southern Pacific System, and some eastern and southern lines. Some of the McKeen cars are in service and many of them have made over a million miles—some are well on toward their second million.

The keeping of rail motor cars in service is largely the function of two things: the education of the men who operate the car, and the inspection that is given to the car at periodic times—monthly inspections. Periodic inspection is very valuable in keeping these cars in service. There are some places where this inspection cannot be so complete as at other points where they run on remote branch lines. It is more difficult to give them the thorough inspection they receive near larger terminals.

Mr. Purcell: I move you that the report be received and printed in the proceedings, and that the committee be given a vote of thanks.

(The motion was seconded and carried.)

Railroad Power Plants and the Purchase of Power

Developments in design and economy—Conditions which determine advisability of isolated plant

By A. A. Potter

Dean of the Schools of Engineering and Professor of Power Engineering, Purdue University, Lafayette, Indiana

A. A. Potter

Water and fuels—coal, oil, gas—are the main energy resources for power production. The power resources of the United States in heat equivalents have been estimated as follows: Bituminous coal, 55 per cent; anthracite coal, 10 per cent; oil, 18 per cent; firewood, 6 per cent; natural gas, 4 per cent; water power, 4 per cent; and wind power, 0.1 per cent. Thus for the generation of power, coal and oil have major significance.

Factors which Influence Power Plant Economy

Steam plant economy has been improved at least 25 per cent during the past decade. These gains have been brought about mainly by improvements in the boiler room. Modern practice has improved not only the efficiency but also the steaming capacity of boiler plants.

There is a general trend in all types of power plants—industrial and utility—toward higher steam pressures and temperatures. Forty years ago 120 lb. and saturated steam were the limit. Over one million horsepower is now being developed in this country by steam at a pressure of about 600 lb. and a temperature of 725 to 750 deg. F. In several installations pressures of 1,200 to 1,400 lb. are used. High steam pressures and temperatures are particularly advantageous for plants where use can be made of exhaust steam for heating or for other purposes, and where condensing is impractical.

Higher feedwater temperatures and improvements in furnace design and in fuel burning equipment have also contributed greatly to improved fuel economy. Savings are also produced by educating various departments not to waste power, to use exhaust steam in place of live steam and hot water in place of steam where practical.

Steam-making surfaces are being arranged to better advantage. Furnace volumes are being increased to make operation at high ratings possible. Boilers operated continuously at ratings of 300 per cent are common and in some cases boilers have been forced to 700 per cent rating.

Improved power plant economy is being secured by designs to suit the fuel available, by economical fuel-handling methods, by clean feed water at high temperature, by boiler surfaces free from soot and scale, boiler settings and baffles free from leaks, by properly covering piping and other equipment which lose heat by radiation, by the best utilization of exhaust steam, and by sufficient instruments for the purpose of keeping a careful check on plant conditions.

Suitable instruments to record performance are being used generally in modern power plants. Practically every progressive power plant is equipped not only with indicating and recording gages to record steam pressures on boilers, headers, and near engine or turbine throttle, but also with recording thermometers to measure the temperatures of feedwater, flue gases, and steam; means for measuring feedwater and fuel used; means for metering steam generated by boilers and steam used for different purposes; draft gages: CO_2 recorders or other instruments for analyzing flue gases; electrical instruments; also special instruments and meters to suit local conditions. Centralized systems of combustion control are being installed in most of the newer power plants and special devices are being installed to reduce to a minimum physical exertion on the part of the operating force.

Power Plant Design

The objectives to be sought in a power plant are reliability of operation and a cheap product, whether that product is steam, electricity, or mechanical power. In other words the plant must be dependable and commercially efficient to justify the investment.

The cost of the product per unit output from a power plant depends upon the fuel used, cost of repairs and replacements, amount paid for operating labor, and fixed charges. The fixed charges—interest, rent, depreciation, obsolescence, taxes, and insurance—in most modern power plants have been going up while the cost of fuel and operating labor has been going down. In some large steam-electric power plants, the fuel and labor cost per unit of output has been cut in two during the past 10 years and in many plants the cost of fuel per unit of output is only about one-half the fixed charges.

In designing a power plant or in expending funds for improvements, care must be taken that the gain in economy justifies the investment. The load factor or the sustained use of power influences power plant design. The higher the load factor, the greater is the justification for high investment costs to increase fuel economy.

The cost of buildings for power plants varies at present from 15 to 35 per cent of the total cost of the plant. Accordingly, care must be taken to reduce the volume of power plant buildings to a minimum. Present practice is to place breechings on roofs of buildings to reduce roof heights and to make most advantageous use of space for offices, auxiliary rooms, oil storage, etc.

The design of the power plant should be fitted to the fuel which can be obtained to best advantage. In designing equipment for a certain fuel care must be taken that the continuity of the fuel supply is assured and that the mine preparation methods will insure uniform quality. Smokeless and efficient combustion can be obtained with any fuel if the furnaces are properly designed. Furnaces should be so designed that the boilers will operate at fairly high ratings. High ratings, however, are a matter of investment and must be considered together with other factors.

Even the small plant will find automatic or semi-automatic stokers economical in both labor and fuel. In selecting a stoker consideration should be given to the fuel used, the character of the load, draft available and size of combustion space. The use of powdered fuel has produced material savings in large power plants. However, with recent improvements in mechanical stokers any extensive use of powdered fuel for small power plants is not justified at the present time.

High-pressure steam accumulators are being used to an increasing extent to take care of fluctuations in steam demands. This type of equipment should prove advantageous for plants with limited furnace volumes.

Purchased Power Versus Isolated Plant

The utilization of exhaust steam and the reliability of the power furnished by the public utility are the two determining factors. Maximum heat utilization is possible for a non-condensing power generating unit, if there is sufficient need for exhaust steam. There is, however, considerable difficulty in

securing a proper balance bettwen power and heating requirements.

The type of drive used must also be considered. Electric drives for all types of tools are becoming popular, as electric motors of widely varied characteristics are being built in sizes and speeds to suit different uses. Where considerable electric current is used for lighting and power and little use is made of exhaust steam, purchased energy is usually more advantageous. Ordinarily, a progressive public utility is able to sell power to a large user rather cheaply.

Where sufficient use can be found for exhaust steam the major portion of the year and where considerable steam is needed for driving special equipment the isolated plant should receive favorable consideration. Ordinarily, if 15 to 25 per cent of the power can be generated as a by-product of the heat supplied for other purposes it is advantageous to consider an isolated power plant to carry all or a part of the load. In some cases pooling of the energy with the electric utility may even be practical. In many cases it is desirable to retain the present plant for heating and for generating a portion of the load and to purchase the remainder from a utility. In small shops it is usually not advisable to construct a power plant, but better results are accomplished by installing a low-pressure plant for heating and by purchasing electricity for light and power from a utility.

Among the most remarkable accomplishments of the past decade have been the improvements in large power plants. Some of the best modern power plants generate a kilowatt-hour for less than one pound of coal. Accordingly, it is desirable for all users of power not to consider the building of an isolated plant unless they are certain that the dependability and commercial efficiency of such a plant will result in cheaper steam and electricity than can be secured by purchase from a utility.

Cheap power is primarily responsible for the progress of our age. Through cheap power we can save labor, increase the product of the worker, and lessen human drudgery.

Mr. Chambers: I move that the paper be received and printed in the proceedings and a vote of thanks extended to Dean Potter.

(*The motion was seconded and carried.*)

Report on Locomotive Design and Construction

Designs for crank pins, wheels, boxes, pistons———High boiler pressures———Oil-electric locomotives

W. I. Cantley
Chairman

Your Committee has, during the year, given further consideration to the following subjects:

Standardization of fundamental parts of locomotives.

Exhaust-steam injectors and exhaust-steam feedwater heaters.

Advantages and disadvantages of boiler pressures higher than 200 lb.

Development and use of the oil-electric locomotives in railroad service.

Use of back-pressure and initial-pressure gages, including cut-off control on locomotives.

Individual paper on spring plant developed at the Mt. Clare shops of the Baltimore & Ohio.

Standardization of Fundamental Parts of Locomotives

In continuance of the work begun in 1927, the subcommittee on Standardization of Fundamental parts of Locomotives has undertaken for its work this year the development of desirable practices in the design of the following locomotive parts: Crank pins; driving boxes; engine truck boxes; driving wheel centers; trailer wheel centers, and pistons and rods.

The practice recommended for main crank pins is illustrated in Plate 1. The determining factors of main crank pin design are piston thrust and location of center line of cylinders with respect to the hub face of the main driving wheel, as indicated by dimension "L" in Plate 1. Both of these factors are as a rule quite definitely determined by the size of the locomotive, the power required of it, and the clearances which must govern its construction. The dimensions and stresses proposed are suitable for steel having an ultimate tensile strength of 80,000 to 85,000 lb. per sq. in., as covered by A. R. A. material specifications for axles, shafts and other forgings.

Plate 2 illustrates the practices recommended for crank pins other than main. These designs are suitable for the same steel as mentioned above.

The use of male-threaded end with nuts and collar, as shown in Fig. 2-a, is recommended for all crank pins to which this arrangement may be applied. Castle nuts have been used by some roads in place of the double nut arrangement shown, but double nuts are more generally used. Crank pins of front driving wheels and others that are located between guides, crossheads, or main rods, usually require an arrangement which takes up less space. For these pins, either the arrangement of Fig. 2-b or that of Fig. 2-c may be used. The arrangement of Fig. 2-b has the advantage of being more economical of space and is quite generally employed. The arrangement of Fig. 2-c is the stronger of the two, but has not come into extensive use.

The stresses proposed for main and other crank pins represent

Table No. I

Table of Tabulation and Specifications of Oil-Electric Locomotives.

Country	No.	Builder Locomotive	Owner	Builder Engine	Builder Electric	H. P.	Total Weight Loco.	Weight per H.P. Eng. only	Weight per H.P. Total	Cylinders No. & Size	Cycle	Fuel Injection	RPM Engine	Wheel Arrangement	Date in Service
USA	1	A.L.Co.	C.R.R.N.J.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1925
USA	1	A.L.Co.	B.& O.R.R.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1925
USA	1	A.L.Co.	L.V.R.R.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	C.& N.W.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	Erie	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	Reading	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	D.L.& W.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	C.& N.W.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	Utah Cop.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	I-R.Co.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1926
USA	1	Brill	L.V.	Mc.S.	G.E.	300	152M	90.0	507	12- 8 x 9½	4	Air	500	4-4	1927
USA	1	A.L.Co.	L.I.	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	1925
USA	1	A.L.Co.	Red Riv.	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	G.N.	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	1926
USA	1	A.L.Co.	L.I.	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	1927
USA	1	A.L.Co.	N.Y.C.	I.R.	G.E.	300	257M	56.7	333	6-10 x12	4	Solid	600	4-4	1928
USA	1	A.L.Co.	N.Y.C.	I.R.	G.E.	750	291M	90.0	390	6-14½x16	4	Solid	500	4-8-4	U.C.
USA	1	A.L.Co.	N.Y.C.	Mc.S.	G.E.	900	348M	91.0	397	12-14 x18	4	Air	300	4-8-4	U.C.
USA	1	P.R.R.	P.R.R.	Bem.	West.	500	130M	40.0	260	8- 8½x12	4	Solid	800	0-4-0	U.C.
USA	2	Bald	L.I.	West.	West.	300	90M	54.0	300	6- 8½x12	4	Solid	750	0-4-0	1928
USA	2	A.L.Co.	Erie	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	1927
USA	1	A.L.Co.	C.& N.W.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1927
USA	1	A.L.Co.	Reading	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1928
USA	1	A.L.Co.	Am.R.Mi.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	1928
USA	1	A.L.Co.	Am.R.Mi.	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	U.C.
USA	1	A.L.Co.	L.I.	I.R.	G.E.	600	200M	56.7	333	12-10 x12	4	Solid	600	4-4	U.C.
USA	1	A.L.Co.	Doan.St.L.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	U.C.
USA	5	A.L.Co.	Stock.	I.R.	G.E.	300	120M	56.7	400	6-10 x12	4	Solid	600	4-4	U.C.

Ingersoll-Rand 600 H. P. locomotive consists of 2-300H. P. units. *Oil-electric storage battery engine. NOTE.—"U. C." denotes under construction.

safe and conservative practice. They have been exceeded in the design of some locomotives.

Driving and Engine-truck Boxes

Plates 3 and 4 show the practices recommended for driving and engine-truck boxes respectively. In its treatment of driving-box design, the committee has not attempted to cover the design of cellars, nor has it taken up the matter of fitting and grooving brasses, as the arrangement of these details depends largely upon the kind of lubricant used, and there is an extremely wide variation in the practices of different roads. Practically all engine-truck boxes are lubricated with oil that is fed to the journal from waste-packed cellars. Believing that the amount of packing carried in engine-truck cellars of most modern locomotives is not as large as it should be, the committee has provided for the greatest depth of cellar which is felt could be applied in connection with the 30-in. engine-truck wheel while maintaining 1½ in. of clearance between the pedestal binder and the bottom of the engine truck box and cellar, as well as a clearance of not less than 2½ in. between the top of rail and the lowest part of the engine-truck frame. Figs. 4-a, 4-b and 4-c show the construction recommended for boxes of two-wheel engine trucks using plate springs of the semi-elliptical type. With suitable modifications at the top, as shown by Figs. 4-d and 4-e, this box becomes applicable to four-wheel front trucks of the type generally used on passenger locomotives.

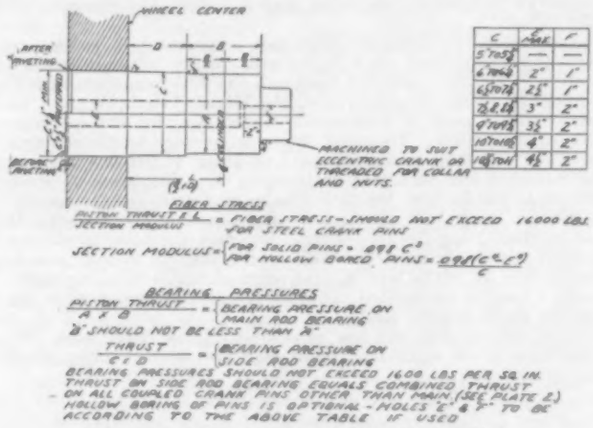

WHEEL CENTER
AFTER RIVETING
BEFORE RIVETING
MACHINED TO SUIT ECCENTRIC CRANK OR THREADED FOR COLLAR AND NUTS.
FIBER STRESS
PISTON THRUST
SECTION MODULUS
BEARING PRESSURES
THRUST
BEARING PRESSURE ON MAIN ROD BEARING
BEARING PRESSURE ON SIDE ROD BEARING
BEARING PRESSURES SHOULD NOT EXCEED 1600 LBS PER SQ. IN.
THRUST ON SIDE ROD BEARING EQUALS COMBINED THRUST ON ALL COUPLED CRANK PINS OTHER THAN MAIN (SEE PLATE 2.)
HOLLOW BORING OF PINS IS OPTIONAL - HOLES "d" & "f" TO BE ACCORDING TO THE ABOVE TABLE IF USED

Plate 1—Recommended Main Crank Pins

Material recommended for both driving and engine truck boxes is cast steel as per A. R. A. specifications for carbon steel castings.

Driving and Trailer Wheel Centers

Pages 3 and 4 of Section F of the Manual now show standard sections for rims and spokes of locomotive driving wheels. The committee, in its work on this subject, has endeavored to utilize these standards as a foundation on which to base more complete recommendations as to driving-wheel design, but has reached the conclusion that some modifications are necessary and therefore recommends, that Fig. 3, page 3, and paragraph 3, page 3-f, Section F of the Manual be removed and superseded by Plate 5 of this report, which shows substantially the same rim section, but proposes to locate the inner edges of the spoke more nearly in line with the inner edges of the rim, thus placing the spokes in better position to resist collapsing stresses resulting from tire shrinkage which are greatest under the flange of the tire. The design recommended in plate 5 is also more consistent with the hub spacing of 54 in., which was recommended by the committee last year and adopted by letter ballot.

It is recommended that the words "For wheel centers 60 in. and over," be omitted from paragraph 2, page 3-f, of the Manual, as it is believed there is no reason for discriminating between wheel centers of different diameters in regard to the matter of solid versus cored rims. This is a matter that should be governed entirely by limitations of counterbalance and total weight of locomotive.

In presenting plate 5, the committee recommends hubs and solid rim sections as shown in Figs. 5-b and 5-c for all locomotive designs in which limitations of weight and counterbalance will permit their use. These features, together with the spokes of Figs. 5-d and 5-e, greatly simplify pattern and foundry work in the manufacture of driving wheels. The solid rim also provides a better support for tires than a cored rim.

The demands for locomotives of increased power which must be built without exceeding certain very definite limits of weight and counterbalance effects have made it desirable to recognize and approve any feature of design that will reduce weight and for this reason the committee has included as an alternative practice the cored rim sections of Figs. 5-f, 5-g and 5-h, and the elliptical spoke section of Figs. 5-i and 5-j, which conform to the foundry practice usually followed in producing driving wheels with cored rims.

The committee recommends solid counterweights cast as an integral part of the driving wheel center in all cases in which the desired counterbalance can be secured with solid cast counterweights. Small lead pockets as shown by Fig. 5-f, are recommended for obtaining closer adjustment than can be had with solid counterweights. For driving wheels which require lead-filled counterweights ,the committee recommends the pocket construction shown by Fig. 5-a, in which the pockets are arranged to be filled through cored holes in the rims of the wheels, these holes being entirely covered when tires are in place.

The design of trailer wheels, as shown by Plate 6, follows the lines laid down in connection with Plate 5 for driving wheel design insofar as hubs, rims, and spokes are concerned. While including among its recommendations a design of cast-steel trailer wheel center 33¾ in. in diameter, further consideration should be given to the development and manufacture of rolled-steel wheels that will be entirely satisfactory for use on trailer trucks requiring wheel centers 33¾ in. in diameter, or smaller. Some rolled-steel trailer wheels of this size are now in use, but their performance indicates that further development and improvement is desirable. The experience of some roads has been that more trouble has been experienced with breakage of tires of the bolted type than with plain shrinkage tires of the same sizes. The committee therefore feels that shrinkage tires should be used in all cases.

Cast steel as per A. R. A. specifications for carbon steel castings is recommended as the material to be used for driving and trailer wheel centers of these designs.

Pistons and Rods

Information furnished by various roads and locomotive builders indicates that most of the locomotives built during recent years have been equipped with rolled- or cast-steel piston heads of the conical type. The angle of the cone section of the piston head, as well as the thickness of sections, as shown in Plate 7, agree with standard sections produced by manufacturers of rolled-steel pistons.

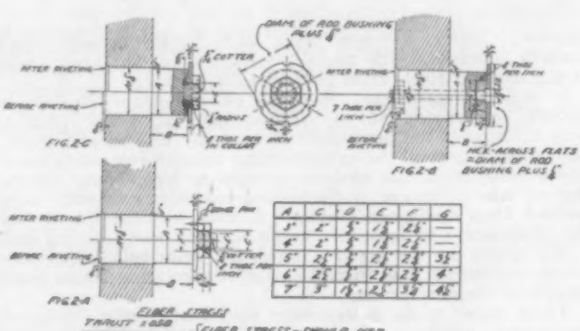

DIAM. OF ROD BUSHING PLUS ⅛
AFTER RIVETING
BEFORE RIVETING
FIG. 2-C
FIG. 2-B
HEX. ACROSS FLATS = DIAM. OF ROD BUSHING PLUS ⅛
FIG. 2-A
FIBER STRESS
THRUST = 0.65D
SECTION MODULUS = 0.098 C³
THRUST = 0.2 W R/r
W = WEIGHT ON PAIR OF DRIVERS
R = RADIUS OF DRIVING WHEEL
r = RADIUS OF CRANK
SECTION MODULUS = 0.098 A³
NOTE:- SIZE OF CRANK PINS OTHER THAN MAIN IS GENERALLY GOVERNED BY BEARING PRESSURE
BEARING PRESSURE
THRUST = BEARING PRESSURE - SHOULD NOT EXCEED 1600 LBS.

Plate 2—Recommended Crank Pins other than Main

There are so many different arrangements and styles of packing rings, bull rings, as well as arrangements for facing the periphery of piston heads or bull rings with anti-friction metals, such as cast iron or bronze, that the committee cannot see its way clear to recommend any one, or group, of these arrangements to the exclusion of others.

The design recommended for piston rods is suitable for annealed carbon steel of 80,000 lb. minimum tensile strength in accordance with A. R. A. specification for medium forgings of this material, but heat-treated steel as per A. R. A. specifications for forgings of either quenched and tempered carbon steel or quenched and tempered alloy steel is recommended.

Material in piston heads may be either wrought steel or cast steel having a minimum tensile strength of 60,000 lbs. per sq. in.

The report of the subcommitte on Standardization of Funda-

mental Parts of Locomotives is signed by H. H. Lanning (chairman), A. Kearney and W. L. Bean.

Exhaust Steam Injectors and Exhaust Steam Feedwater Heaters

The subcommittee on Exhaust Steam Injectors and Exhaust Steam Feedwater Heaters has continued the investigation on development of this equipment and can offer only a progress report at this time.

Looking into the status of the device, we find one manufacturer, as of March 26, 1928, has 220 exhaust-steam injectors in service, and an order for 38 additional pending.

One of the principal drawbacks in the development and application of the exhaust steam injector in this country is the complication of manual operation as compared with the common

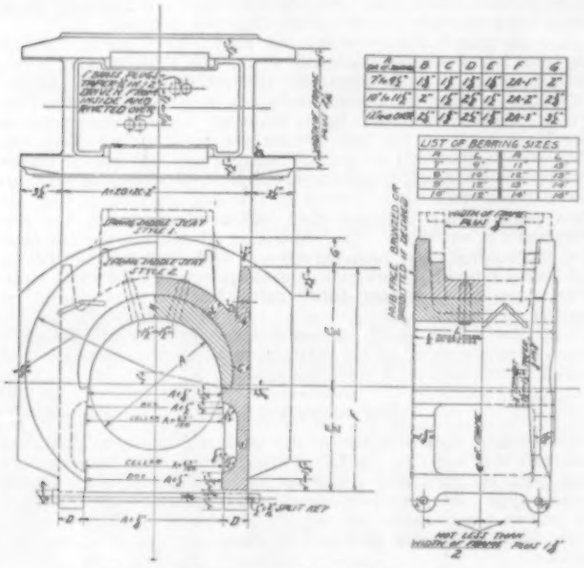


Plate 3—Recommended Driving Boxes

injectors. Efforts are now being made by the manufacturers towards simplifying the manual operation by the introduction of automatic controls from exhaust to live steam.

It will be appreciated that the exhaust-steam injector is strongly competitive with the straight feedwater heater, particularly as regards the percentage of economy in fuel and water, and while in general the exhaust-steam injector represents lower priced installation, the modern superpower locomotives require that we take advantage of the highest attainable economies to be derived from feedwater heating. It must be remembered that the development in feedwater heater has not been standing still.

We allude to the trend toward the centrifugal feedwater pump, which bids fair to replace the reciprocating steam pump largely in the near future.

There seems to be a legitimate field for a fully developed, thoroughly reliable, exhaust steam injector with simplified manual control, for moderate size and smaller size existing power, where it is desirable to obtain some economies in fuel and water at a comparative low investment charge.

The report of the subcommittee is signed by A. H. Fetters (chairman), W. I. Cantley, H. M. Warden and M. F. Cox.

Advantages and Disadvantages of Boiler Pressures Higher Than 200 lb.

Advantages and disadvantages of high boiler pressures having been covered in the 1927 report, this is submitted as a supplement thereto and covers, so far as data is available, such progress as has been made during the year.

Up to a year ago it was generally thought that 250 lb. was the practical limit of pressure in boilers of the radial stayed type, particularly in capacities suitable for railway service in this country. However, the Delaware & Hudson now has in operation two locomotives with radial stayed boilers in which pressures of 275 lb. and 300 lb. respectively are used, and a third using 325 lb. is contemplated. The operation of these locomotives will be closely observed in comparison with that railroad's two water-tube firebox locomotives, the "Horatio Allen," using 350 lb. pressure, and the "John B. Jervis," using 400 lb. pressure.

The two last mentioned locomotives were referred to in last year's report—only one, however, the "Horatio Allen," having been in service up to that time. Reports on the operation of all these locomotives are encouraging and it will be of interest to note such comparisons as may be made of the two types of fireboxes.

During the four months in which the 300-lb. radial stayed type has been in operation, high temperature conditions, reaching 800 deg. F., at the steam chests have existed at times. No serious effects have been noted from this high temperature and no packing renewals have been required.

Several roads are using, or are interested in the development of equipment using pressures exceeding the conventional and are thus contributing to a fuller knowledge on this subject. The Santa Fe is working on radial stayed boilers for pressures of 275 lb.

Two roads are doing considerable development in connection with the use of alloy steels in the construction of high pressure boilers. One, the Canadian National, has 40 locomotives and 12 additional on its subsidiary line, the Grand Trunk Western, in which use is made of high-tensile silicon steel for the construction of the boilers. This steel shows an average tensile strength of about 76,800 lb. and yield point of about 46,100 lb. The use of this steel has permitted an increase of boiler pressure from 200 lb. to 250 lb. with but little change in design, size, or weight.

Similar results are obtained by the Canadian Pacific with 44 locomotives using 250 lb. pressure, in which the boiler shells are constructed of nickel steel. This steel shows an average tensile strength of 76,700 lb. with a yield point of 59,200 lb. This represents a gain in strength of about 29 per cent as compared to the carbon steels usually used.

It is evident that the use of alloy-steel and steel stays will contribute to the successful use of high pressures in conventional forms of boilers.

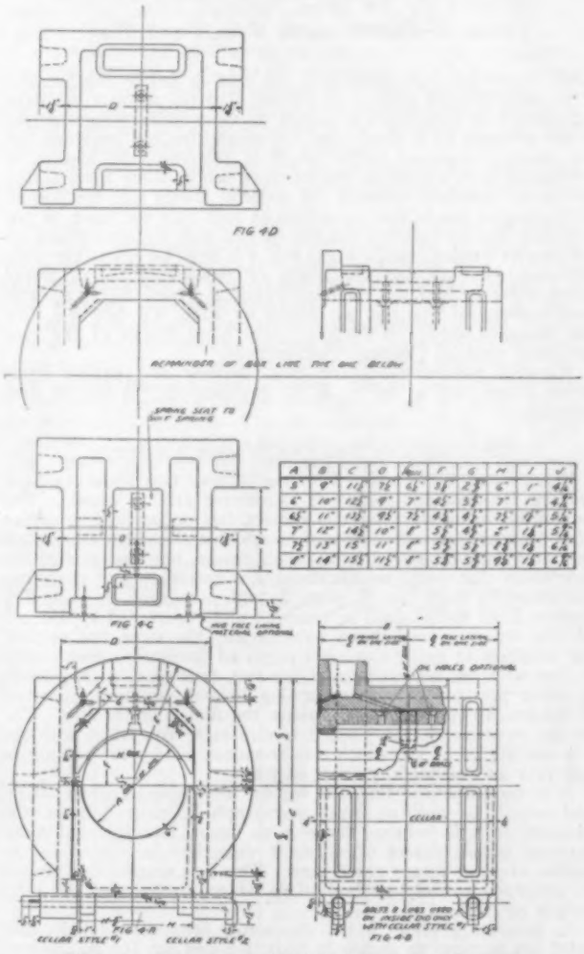


Plate 4—Recommended Engine Truck Boxes

While Europeans still continue their development with ultra-high pressures, the prevailing tendency in this country is to remain below 400-lb. pressure and not depart far from conventional design. This conservative attitude seems preferable at

this time, as it is a relatively simple matter, even with conventional cylinder arrangements, to obtain considerable added economy by taking advantage of the highest possible pressures in radial stayed boilers, coupled with increased superheat up to 800 deg. F.

The highest pressure, it seems evident, must remain below 400 lb., as higher pressures will necessitate the use of water-tube boilers or, to the extent that pressures are increased, freak constructions.

As pressures go up, it is obviously essential that advantage be taken of higher cutoffs, this being, however, difficult to do in a satisfactory manner with the present types of valve gears. This might be accomplished with cam-actuated poppet valves as the intake may be adjusted to give a long period of full port opening with very early cutoff without affecting the long full exhaust port opening. The Caprotti valve gear, which is an outstanding example of that type of gear, fills a gap in that it makes practical the expansion of relative high pressures in a single stage without over-compression.

It is undesirable to introduce the complications of compounding except as it becomes imperative in connection with the use of ultra-high pressures.

Another example of the use of poppet valves is the Buchli locomotive, wherein single-seated poppet inlet valves are used in uniflow type of cylinders. The cutoff is controlled by cams of various shapes or lengths of cam heel, the shaft being arranged to slide laterally to the position selected. In this locomotive the boiler pressure of 850 lb. is expanded in a single stage and the exhaust released to the atmosphere. Some excellent operating results have been obtained with this locomotive, data of which is appended.

With further reference to present European ultra-high pressure locomotives, it is noted that the reciprocating types do not use condensers—the use of condensers being confined to turbine types.

The utilization of water-tubes in high pressure boilers involves the use of relatively pure water, but condensing, as a solution of the water problem, involves overcoming some difficulties when used in connection with reciprocating engines. In particular, there is considerable difficulty with the coating of the condenser tubes with congealed oil carried over in vapor form in the exhaust steam.

The Schmidt-Henschel three-pressure locomotive described in last year's report, exemplifies one system of using ordinary water in that the steam produced from distilled water in the fire-heated surfaces of the firebox is used only as a means of heat transfer to the steam producing drum which is isolated from contact with the flame and gases of combustion. Untreated water is used in the production of the working pressures.

Another means is adopted by Dr. Buchli in his locomotive, wherein the feedwater is brought to a high temperature in the preheater and economizer, and practically all foreign matter precipitated before the water enters the water-tube boiler. These preheater and economizer units are protected from direct action of the flames and are so constructed that they may be readily cleaned.

Still another system, that to be used in the Loeffler locomotive, was described in last year's report. Work is progressing upon the Loeffler system, and much of interest may eventually result.

The Buchli locomotive referred to, is of special interest at this time, representing as it does the simplest possible conception of an ultra-high-pressure locomotive.

Both boiler and engine are relatively simple in design and the necessary auxiliaries are reduced to a minimum.

Weight and cost are approximately that of an ordinary high grade locomotive.

The engine and other operating parts are accessible and simple to service.

Operation of the locomotive is no more complex than conventional types.

Vibration is reduced to a minimum and torque at the drivers is uniform.

Tests have indicated an economy of both coal nad water as compared to conventional types.

Comparative data is given herewith covering the Buchli locomotive and a comparable one of conventional form:

	Buchli	Conventional
Boiler pressure	850 lb.	170 lb.
Heating surface, sq. ft.	1040	1290
Superheater surface, sq. ft.	215	346
Water capacity, boiler, imp. gals.	594	1080
Number of cylinders	3	2
Diameter of cylinders	8½ in.	21¼ in.
Stroke of pistons	13¾ in.	23⅝ in.
Ratio of gear drive	2½ to 1	No gears
Diameter of wheels	60 in.	60 in.
Maximum speed, m. p. h.	50	46½
Wt. in working order, tons	75	90.8

Comparative tests were made of these two locomotives on runs out of Winterthur, Switzerland, under approximately the same operating conditions. Detail figures are not at present available, but Dr. Buchli states that a coal economy of 35 to 40 per cent and water economy of 47 to 55 per cent was obtained in favor of his type of locomotive. It is unlikely, however, that such large economies would be realized, as compared with the large, efficient locomotives in use on the better-equipped American railroads.

For those roads wishing to avail themselves of further economy in locomotive operation without departing materially from conventional practices, there exists the opportunity, previously referred to, for deriving substantial economies by availing themselves of the upper limits of boiler pressures possible in properly designed radial-stayed boilers in conjunction with considerably higher superheat than is now in general use. With this combination of higher pressure and higher superheat, it is still practical to use the conventional two and three-cylinder single expansion arrangement.

The report of the subcommittee is signed by A. H. Fetters (chairman), W. I. Cantley, H. M. Warden and M. F. Cox.

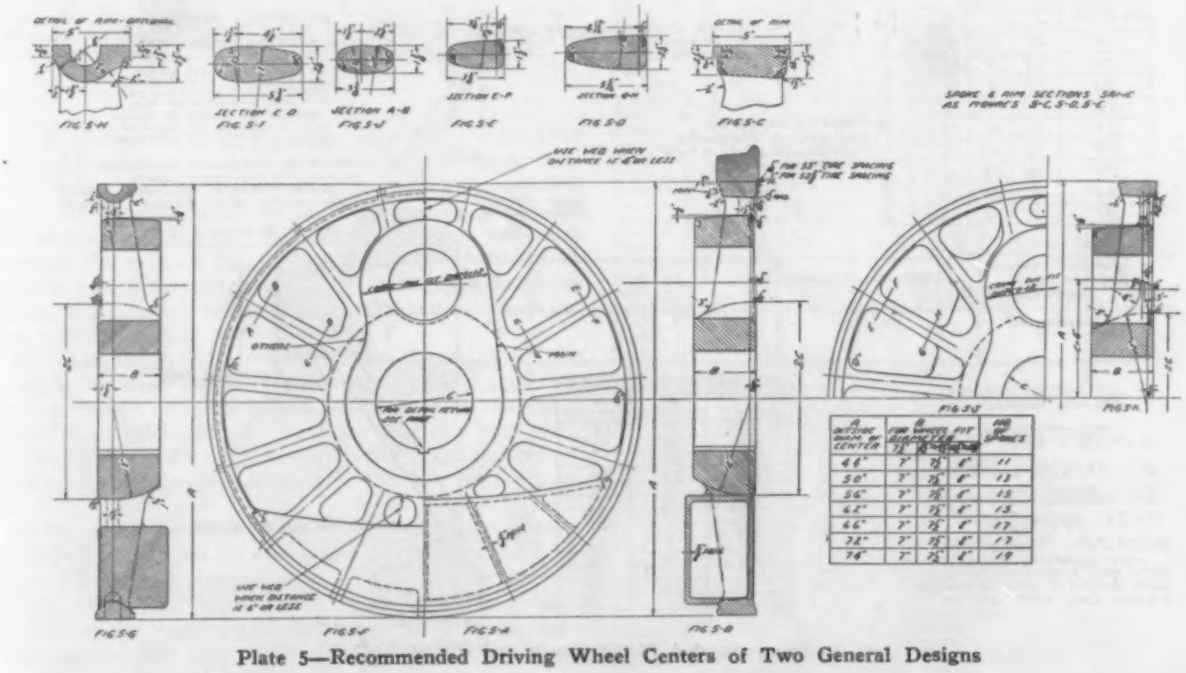


Plate 5—Recommended Driving Wheel Centers of Two General Designs

Development and Use of Oil-Electric Locomotives

The year 1927 has seen the entry of two new oil engines into the oil-electric locomotive field and one new type of oil-electric storage battery locomotive.

The first two engines consist of the Beardmore—as built by the Westinghouse Electric & Manufacturing Company—and the McIntosh-Seymour oil engine—as built by the McIntosh-Seymour Corporation. The Beardmore engine is essentially the same construction as those built by the William Beardmore Company, Ltd., London, England, and is briefly 4-cycle, solid injection, six cylinders, 8¼ in. by 12 in., and develops 300 h.p. at 750 r. p. m. The McIntosh-Seymour engine is a 4-cycle, air injection, having 12 cylinders, 8 in. by 9½ in., and develops 300 h.p. at 500 r. p. m.

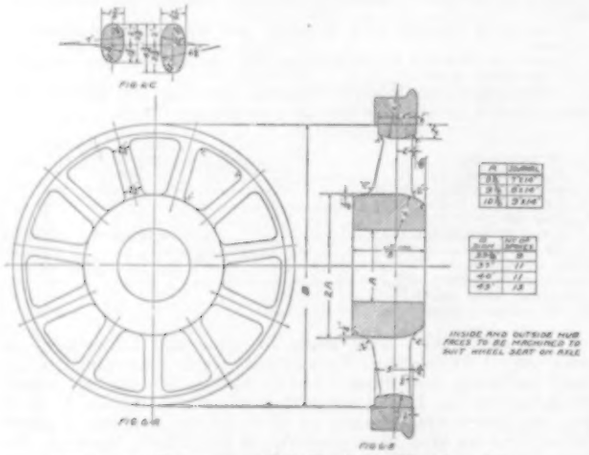


Plate 6—Recommended Trailer Wheels with Cast Steel Centers

The new type oil-electric battery locomotive was built jointly by the Ingersoll-Rand, General Electric Company, and the Electric Storage Battery Company, at the American Locomotive Company's Schenectady plant. This locomotive is designed to operate from internal power furnished by the battery alone, or from power furnished from the storage battery and oil-engine generator together. It can also run from external power furnished by the third-rail or overhead wire in electrified districts. The oil engine and generator is a 300 h.p. unit similar to ones furnished by the Ingersoll-Rand in their 60-ton switcher.

None of the above units has been in service long enough to determine operating or maintenance costs but it is hoped, however, that sufficient information will be obtained during the coming year to enable same to be presented in next year's report.

The oil-electric passenger and freight locomotives for the New York Central and the Pennsylvania switchers, listed in the 1926 report as being under construction, are expected to be delivered sometime during the early summer of 1928.

Recommendations for Future Work—1. Continue study and make report on the development and use of the oil-electric locomotive in railroad service; 2. Continue to collect operating information and data, and, if practical, analyze operating costs and general performance.

General Dimensions of Special Designed Diesel Locomotives on Order or Lately Delivered

	Penna.	N. Y. C.	L. I.
Total weight, lb..	130,000	257,000	*180,000
Length over coupler pulling faces.	26 ft., 10 in.....	46 ft., 8 in.....	25 ft., 6 in.
Rigid wheel base.	10 ft.....	8 ft., 3 in.....	8 ft.
Height	14 ft., 8 3/16 in..	14 ft., 8 in.....	11 ft., 11 in
Width	10 ft., 6 in.....	10 ft., 2 in.....	10 ft., 2 in
Tractive force...	40,000 lb.....	60,000 lb.....	43,000 lb.
Generator	West. No. 476, 330 k. w. at 800 r.p.m.....	G. E. No. DT-502, 200 k. w. at 600 r.p.m..	West No. 477, 200 k. w. at 750 r.p.m.
Motors	2-West. No. 355, 300 hp., each.	4-G.E. No. 286, 300 hp. each..	2-West. No. 308H, 215 hp. each
Gearing	16-76	17-72	16-66
Oil-engine	Bessemer	Ingersoll-Rand .	Beardsmore
Oil-engine hp....	500	300	300
Weight battery...	.....	34,300 lb.....	.....
Type	.....	MVA-41	.....
Number cells.....	.....	218	.....
Ampere-hour at 6 hr. rate.....	.....	680	.....

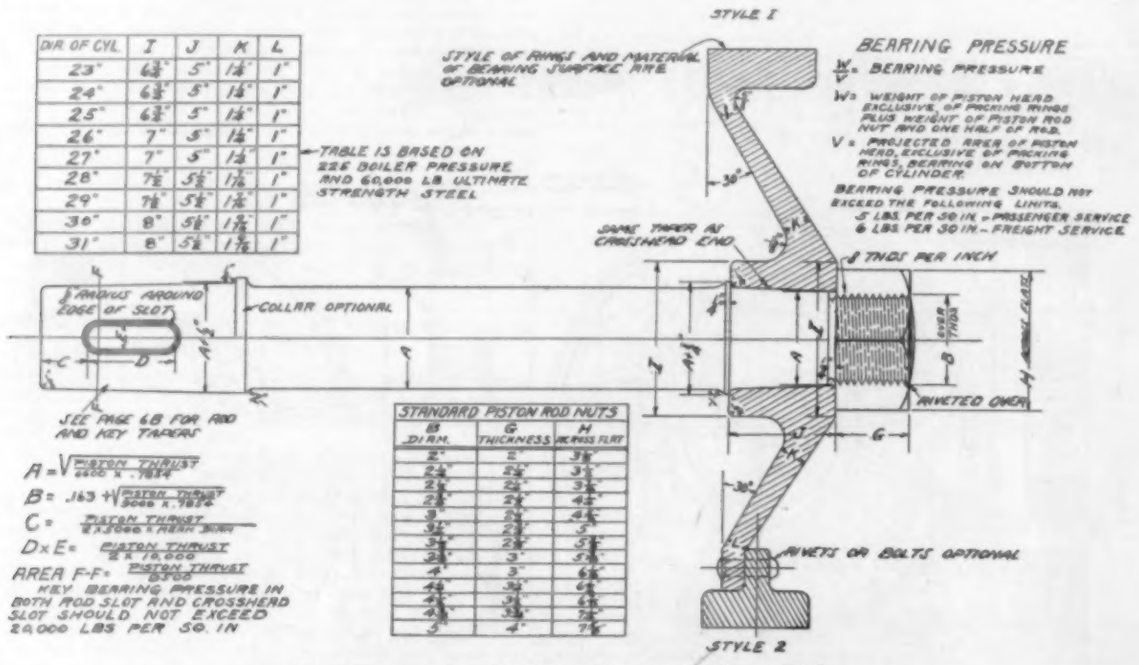
*Weight per single 0-4-0 unit—90,000 lb.
Total weight of locomotive (two units giving an 0-4-0 + 0-4-0 wheel arrangement)—180,000 lb.

The report of the subcommittee on Oil-Electric Locomotives is signed by R. M. Brown (chairman), G. H. Emerson and H. A. Hoke.

Use of Back-Pressure and Initial-Pressure Gages, Including Cut-off Control on Locomotives

The devices covered by the above subject may be grouped as follows:

1. Single-pointer gages to indicate back pressure only.
2. Duplex gages, one hand of which indicates steam chest pressure and the other back pressure.
3. Duplex gages, one hand of which indicates speed of locomotive in miles per hour and the other the position of cut-off.
4. Back pressure cut-off control, a device for automatically regulating the cut-off by means of the back pressure in the cylinder exhaust cavities.


STYLE I
STYLE OF RINGS AND MATERIAL OF BEARING SURFACE ARE OPTIONAL
BEARING PRESSURE
P = BEARING PRESSURE
W = WEIGHT OF PISTON HEAD EXCLUSIVE OF PACKING RINGS PLUS WEIGHT OF PISTON ROD NUT AND ONE HALF OF ROD.
V = PROJECTED AREA OF PISTON HEAD, EXCLUSIVE OF PACKING RINGS, BEARING ON BOTTOM OF CYLINDER.
BEARING PRESSURE SHOULD NOT EXCEED THE FOLLOWING LIMITS.
5 LBS. PER SQ IN = PASSENGER SERVICE
6 LBS. PER SQ IN. = FREIGHT SERVICE.
TABLE IS BASED ON 225 BOILER PRESSURE AND 60,000 LB ULTIMATE STRENGTH STEEL
SAME TAPER AS CROSSHEAD END
3 THDS PER INCH
RADIUS AROUND EDGE OF SLOT
COLLAR OPTIONAL
SEE PAGE 68 FOR ROD AND KEY TAPERS
RIVETED OVER
RIVETS OR BOLTS OPTIONAL
STYLE 2

DIA OF CYL	I	J	K	L
23"	6 3/4"	5"	1 1/4"	1"
24"	6 3/4"	5"	1 1/4"	1"
25"	6 3/4"	5"	1 1/4"	1"
26"	7"	5"	1 1/4"	1"
27"	7"	5"	1 1/4"	1"
28"	7 1/4"	5 1/2"	1 1/16"	1"
29"	7 1/4"	5 1/2"	1 1/16"	1"
30"	8"	5 1/2"	1 1/16"	1"
31"	8"	5 1/2"	1 1/16"	1"

$A = \sqrt{\frac{\text{PISTON THRUST}}{4000 \times .7854}}$

$B = .163 + \sqrt{\frac{\text{PISTON THRUST}}{5000 \times .7854}}$

$C = \frac{\text{PISTON THRUST}}{2 \times 5000 \times \text{MEAN DIAM}}$

$D \times E = \frac{\text{PISTON THRUST}}{2 \times 10{,}000}$

$\text{AREA F-F} = \frac{\text{PISTON THRUST}}{\text{BEARING}}$

KEY BEARING PRESSURE IN BOTH ROD SLOT AND CROSSHEAD SLOT SHOULD NOT EXCEED 20,000 LBS PER SQ. IN

STANDARD PISTON ROD NUTS

B DIAM.	G THICKNESS	H ACROSS FLAT
2"	2"	3 1/8"
2 1/4"	2 1/4"	3 1/2"
2 1/2"	2 1/2"	3 7/8"
2 3/4"	2 3/4"	4 1/4"
3"	3"	4 5/8"
3 1/4"	3 1/4"	5"
3 1/2"	3 1/2"	5 3/8"
3 3/4"	3 3/4"	5 3/4"
4"	4"	6 1/8"
4 1/4"	4 1/4"	6 1/2"
4 1/2"	4 1/2"	6 7/8"
4 3/4"	4 3/4"	7 1/4"
5"	5"	7 5/8"

Plate 7—Recommended Piston Heads and Piston Rods

Gages which indicate both steam-chest and back-pressure are of several styles as follows:

(a) Gages having two hands and one dial, the dial having two scales, the outer scale with graduations suitable for steam chest pressure and the inner one with graduations suitable for the range of back pressure.
(b) Gages having one hand and two dials, the outer dial being stationary and having graduations suitable for steam chest pressure and the inner dial rotating to show the back pressure indicated by a fixed pointer.
(c) Gages having two hands and one dial, the dial being graduated for steam chest pressure. With this gage when there is no back pressure the two hands are together or coincide as to location. As the back pressure increases the hands separate, the extent of the separation indicating the amount of back pressure.

Gages which indicate the speed in miles per hour and the position of the cut-off require a mechanism driven from one of the wheels to give the speed indication, and another mechanism connected to the reverse gear to indicate the position of the cut-off.

The locomotive back pressure cut-off control is a somewhat more complicated device whereby the cut-off is regulated automatically by the back pressure to an economical position.

Each of these devices has for its object the more economical operation of the locomotive and for this reason its development should be encouraged. All of them appear to be more or less in the experimental stage. Many difficulties have been encountered and changes are constantly being made.

If the railroads will select the type or types of apparatus which seem most likely to meet their service requirements and try them out, their experience will help in developing these devices which give considerable promise of effecting more economical locomotive operation.

The subcommittee report is signed by S. Zwight (chairman), R. M. Brown, Geo. McCormick and E. C. Anderson.

Spring Plant of the Baltimore & Ohio at Mt. Clare Shops

[This subcommittee report, submitted by George H. Emerson, is accompanied by 16 illustrations. They give the layout of the spring plant at the Mt. Clare shops, Baltimore, Md., together with drawings of furnaces, quenching tanks, machinery and equipment for testing and control. The text describes the procedure followed, the character of steel used and instructions for the manufacture of springs. The furnaces are equipped with pyrometers and Brown Automatic Control. The description of this plant will appear in the July issue of the *Railway Mechanical Engineer*.—Editor.]

The report of the committee is signed by W. L. Cantley (chairman), Lehigh Valley; H. H. Lanning (vice-chairman), Atchison, Topeka & Santa Fe; H. A. Hoke, Pennsylvania System; A. Kearney, Norfolk & Western; G. McCormick, Southern Pacific; W. L. Bean, New York, New Haven & Hartford; E. C. Anderson, Chicago, Burlington & Quincy; M. F. Cox, Louisville & Nashville; C. E. Brooks, Canadian National Railways; G. H. Emerson, Baltimore & Ohio; A. H. Fetters, Union Pacific; S. Zwight, Northern Pacific; R. M. Brown, New York Central and H. M. Warden, Missouri-Kansas-Texas.

Discussion

FUNDAMENTAL PARTS

C. J. Bodemer (L. & N.): On page 3, the committee has indicated that the hub face is to be bronzed or babbited if desired. It is important to get an expression from the various members of the railroads as to the best method of securing the babbit or bronze hub liner through the face of the driving box. A great deal of trouble is experienced by railroads with hub liners on boxes, and it would be valuable to find out which is the best practice in that respect.

Mr. Lanning: The sub-committee hesitates to express an opinion on that line because of the fact that there are such wide variations in the practice followed by different railroads. I would say that the best practice would be to face the box with the brass secured or dovetailed in grooves machined in the face of the steel box.

G. W. Rink (C. R. R. of N. J.): The brass shown in plate 3 is secured by two taper plugs, tapered 1/16 in. in 12 in. and riveted over. It would be preferable to make that taper about ½ in. in 12 in. Also, why rivet it over? The tendency in riveting the brass over would be to loosen it again. This feature should be dispensed with.

Mr. Lanning: One-sixteenth in. taper in 12 in. is probably the commonest reamer that is found in the locomotive shop or engine house. It is very widely and successfully used for this purpose.

With regard to the riveting over of the plugs, I fail to see any reason why that should loosen the plug, provided it is properly backed up when the riveting is done. The tendency of the riveting would be to enlarge the plug rather than to drive it out.

Mr. Chambers: I would like to hear an expression from those who are using exhaust steam injectors as to the success they have obtained.

B. B. Flory, (N. Y. O. & W.): We have several different designs of the exhaust injector, and feel that they are very successful in operation. The cost of the injector is much less than the feedwater heater, and the maintenance is quite small. We made a number of tests, and are obtaining a saving of approximately nine per cent in fuel, which probably is not as large as you might get with a feedwater heater, but on small or moderate power the expense is justified. The exhaust steam injector will answer the purpose nearly as well as the feedwater heater.

(*Motions to accept the sections of the report on fundamental parts, and exhaust steam injectors were seconded and carried.*)

[After the chairman announced that the remainder of the report would be presented and discussed during tomorrow morning's session, the meeting was adjourned. —Editor.]

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Continued from Page 1420D118

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Hipson, A. F., Pass. Rep., Penna.
Geo. A. Hoffman, For. Mech. Dept., A. T. & S. F., Strand
J. W. Holder, Insp. I. C. C.
J. Holzbach
J. M. Hughen, V. P., Penna. Tank Line, Traymore
A. E. Hummel, Ch. Tr. Disp., A. C.
Hunter, Jack, Marlboro
H. E. Huntington, G. P. A., B. R. & P., Chalfonte
Hyde, Richard, Strand
M. Iwasaki, Resident Representative, Japanese Government, Chelsea
W. J. Jenks, V. P., N. & W., Ritz-Carlton
A. H. Johnson, Insp. Loco., I. C. C., Shelburne
Harley A. Johnson, Dir. of Res., A. R. A., Ritz
Louis S. Kammer, Pass. Agt., Reading
Harry Kauffman, S. M. P., F. E. C. R. R., Ambassador
H. N. Knocke, Asst. For., P. R. R.
E. J. Kuhn, Ch. Dr., M. K. T., Ambassador
H. S. Lambert, Ch. Cl. to Asst. to Pres., C. of N. J.
Stacy Lambeth, Mach., Sou.
Lavoie, Maurice, Shelburne
H. S. Leard, S. P. O., S. A. L.
D. J. Libby, Gen. Agt., N. Y. N. H. & M.
Albert Lewis, New Belmont
Lister, Francis, Jr., Ritz Carlton
Lowder, Howard, Dist. Pass. Agt., Pullman
Alex. G. MacCallister, Jr., Draftsman, Reading
H. T. Malcolmson, Gen. Mgr., T. H. & B., Dennis
Mallory, C. E., Supt. Kingan Ref. Line, Traymore
Joe Marshall, Spec. Rep., A. R. A., Haddon Hall
McAllister, John C., Pier
C. V. McCoy, Frt. Trmas., Reading, Ambassador
J. F. McCullough, B. & M., Knickerbocker
McHale, Edwin F.
Frank McManamy, I. C. C., Marlborough
Ernest F. Mechlin, Eastern Rep., W. R. R. A., Brighton
Wm. C. Merklen, Draftsman, N. Y. C., Jefferson
Mettinger, E. E., Rate Clerk, Penna.
G. O. Moores, Eng. Cons., B. & O., Arlington
John W. Moorhouse, Draftsman, Reading
Stump Moring, Ch. Cl. to Val. Eng., S. A. L., Marlborough
R. C. Morse, G. S., P. R. R.
Jas. S. Murphy, D. P. A., P. R. R.
Charles S. Nash, S. M. P., I. C. C. R. R., Chalfonte
Scott R. Necley, Asst. Eng. Elec., Reading
A. Nordheimer, Asst. Engr., N. Y. C. R. R.
C. D. O'Connor, Supt. of Trans., A. and S., Chalfonte
W. L. Oswald, Jr., Elberon
A. G. Pack, Ch. Insp., I. C. C., Shelburne
Leon R. Palmer, Traymore
C. W. Parrish, Cl., N. & W., Ambassador
G. F. Patten, Shop. For., B. & O., Brighton
W. J. Patterson, Asst. Director Bur. of Safety, I. C. C., Marlborough
C. H. Pendleton, Insp. of Loco., I. C. C., Shelburne
John H. Peters, Paint. For., B. & O.
G. T. Pettigrew, G. F. A., Grand Trunk, Chalfonte
C. Poe, Gen. Supt., B. & M., Shelburne
Nicholas Powers, C. T. D., Reading
Everett Ranshenberger, Belmont
G. H. Ravelli, U. S. Rep., Netherlands Ry., Shelburne
Burt Reed, Asst. For., A. C.
W. W. Rhords, Asst. Ch. Cl., Reading, Strand
Richardson, L. A., Jr., C. R. I. & P., Marlboro
J. J. Robinson, M. M., Newport News, Traymore
H. N. Rodenbaugh, Vi. P., F. E. C., Brighton
G. Rule, Engr., B. & O., Castro
H. Schwarzkopf, Asst. Chief Mech. Engr., German State R. R.
S. L. Shank, Div. P. A., P. R. R., Chalfonte
John A. Sheedy, Jr.
John A. Shirley, Asst. Ch. Insp. Loco., I. C. C., Shelburne
Frank T. Siebert, Insp. Loco., I. C. C., Commercial
Simpson, G. R., U. S. Pat Off., Dennis
Gifford Skelton, Traymore
H. E. Sleets, G. F. P. A., Contour, Brighton
Newburn, Smith, Chelsea
W. T. Smith, S. M. P. Ret., C. & O., Lexington
Preston S. Sparks, P. A., Reading
Stark, Raymond F., Desp. Off., A. C. & S.
C. Roland Tatum, Marlborough
James E. Turk, Ret. Ch. Supt., Reading
James B. Urie, Asst. Boiler For., C. R. R., Hanover
R. W. Walsh
Ray N. Wamdoren, V. P., C. & N. W., Haddon Hall

Supply Officers Hold Essay Contest

Over sixty entries in second annual competition among younger men——Winners read papers

FOR the second consecutive year, the Purchases and Stores Division held a contest during the year among the younger men of the railway supply organization for essays on purchasing and stores work. The purpose of this contest is to stimulate the interest of the junior and prospective officers in the problems and responsibilities of these branches of service, all employees below the rank of assistant purchasing agent and assistant general storekeeper being eligible. It was provided that the winning authors should be brought to the annual meeting to read their own papers.

There were sixty-two papers entered in the contest, out of which three papers, one from the Southern Pacific, a second from the Chicago, Milwaukee, St. Paul & Pacific, and a third from the Illinois Central, were given first place and five others awarded honorable mention. The authors of the prize papers were James M. Day, foreman of stores S. P.), who was one of the winners of the preceding year's contest; Clifton E. Oeschger, chief clerk, stores department (C. M. St. P. & P.), and John R. Stokes, assistant division storekeeper (I. C.).

Those receiving honorable mention were George W. Leiber, superintendent reclamation (M.-K.-T.); Dana D. Phillips, clerk, purchasing department (B. & M.); L. E. Baker, assistant general foreman (L. V.); C. L. Wakeman, chief clerk (U. P.), and H. F. Burnett, general store foreman (K. C. S.).

The judges were C. E. Walsh (Penna.); C. B. Tobey (L. V.), and G. E. Scott (M.-K.-T.). The winning papers are presented in part as follows:

Psychology Applied to Economical Railway Storekeeping

By Clifton E. Oeschger

Chief Clerk, Stores Department, Chicago, Milwaukee, St. Paul & Pacific

C. E. Oeschger

Psychologists tell us that 10 per cent of the people think, while the other 90 per cent unconsciously follow the thinkers, and to every 10 men physically lazy, there are 1,000 men with stagnant minds. Thinking is a creative activity that develops ideas. Ideas and money rule the world.

In the smaller sense, our business is storekeeping, in the larger sense, it is transportation. We are engaged in the business of transportation for net earnings. Profits are determined principally by the economy and efficiency of operation. In this pursuit, the purchase and stores department play a most important part in that they have jurisdiction of nearly one-fourth of the entire gross earnings which is spent yearly for material and supplies. Material is money, and the railroad's financial problem is the storekeeper's concern.

The stores department has decidedly justified itself from the point of service and economic value. We are gradually winning the required executive backing and being vested with the authority to fully demonstrate the department's capabilities. Our scope is increasing. Supplying material to meet regular requirements has been reduced to a system that is functioning with commendable precision. The economic side needs to be emphasized. Railroad managements are now primarily looking to us to help bring down material costs.

No organization can advance on past laurels. Our biggest problem is that of improvement and it is ever before us. We need constantly to give serious thought to the right perspective, a more clearly defined program, to leadership and developing men, to spending cautiously, handling and distributing more economically, checking waste, reducing stocks, to carrying costs and the amount of material used; also to getting a better control of line-material, educating men in the proper use, salvage, reclamation and scrapping of material, and to applying new methods in carrying a $560,000,000 stock and distributing $1,700,000,000 worth of material each year.

The present need is not so much for outside experts. They are often just ordinary men away from home. The real need is for alert, practical storekeepers with a vision of their full opportunity and responsibility. It is not individually up to the head of the department, but up to every storekeeper, to carry out his part in saving material expenditures. Saving money is making money, just as surely now as it was in the days of "Poor Richard." It is my conviction that the storekeeper who cannot save in cold cash more than his yearly salary, for his railroad, in addition to running his department efficiently, is a parasite on the job. He is a negative instead of a positive factor in railroad progress and has no place in the stores organization.

The Right Personal Viewpoint

Socrates' philosophy was, "Know Thyself." There is a fine suggestion in the story told of three men, who while hewing stones on a large construction project, were interviewed as to what they were doing. The first, aimlessly, said he was "busting stones," the second "working for three bucks a day," while the third man enthusiastically said that he was "helping to erect a fine building." The "stone-buster's" work lacked quality, that of the "three-buck-a-day" man lacked quantity, while the last man, who industriously and intelligently applied himself, delivered more than either in both quality and quantity.

Developing Men

We deal in two values,—material and men. One of the biggest tasks in interesting and developing men to do their best. The man that thinks, does well, but he who keeps others thinking does better. The real leader makes working conditions pleasant and instead of ever using the weapon of force, lures the best out of his subordinates. Men must have a clear conception of what is expected of them and be thoroughly "sold" on the importance and value of their work. The progressive executive will establish cordial relations, solicit ideas and develop initiative in his personnel. This structure of handling men must also be backed with something tangible. Conscientious effort and production must receive their due recognition and proper remuneration to promote the right incentive to duty.

"Economy First"

Without good will, business fails and banks break. The storekeeper needs the good will and co-operation of other departments and the entire railroad personnel. The latter should be schooled in the proper use, salvaging, reclamation and scrapping of material. Material economy meetings are recommended. "Economy First" is a rival slogan to "Safety First." It takes advertising and group action to put over big continuous economy programs and it is the business of the storekeeper to keep the fires glowing.

The selling price of our service to the public is fixed by Interstate Commerce Commission rates and by competition. If we are to hold the position of leaders in transportation, volume must be held and increased. Costs, of which material compares approximately 25 per cent, must be reduced. The storekeeper is a vital factor in accomplishing this for his company. He is a big link in the financial welfare and progress of rail transportation.

The Service of Supply and How to Improve it

By James M. Day

Foreman of Stores, Southern Pacific, Pacific Lines,
West Oakland, Calif.

J. M. Day

When it is considered that the purchase and stores department has the responsibility of serving all other departments of a railroad, and that out of every dollar spent by the railroads readily be seen how even a small percentage of the total saved or lost in buying, storing and handling might for material and supplies, it can for operating purposes, 40 cents goes represent the difference between success and failure, and it must be apparent to all that an officer intrusted with the expenditure of these large sums must be a man of character, ability and experience, and must have the absolute confidence of the chief executive officer.

The days of easy profits are evidently over, due to keen competition. The tendency of many railroad purchasing and stores departments is toward greater detail, towards a more careful following up and comparing not only of the life and cost of individual parts, but even of isolated operations on individual parts in order that the purchasing agent may have the largest field possible for competitive prices. This can only be brought about through the co-operation between the purchasing department and stores department.

As an illustration of this co-operation, the preparation of a purchase requisition by the stores department may be said to represent the last resort of the stores department in providing for necessary requirements. The storekeeper should not sign a purchase requisition requesting expenditures from the treasury until he has exhausted all other possible sources of supply and is convinced that nothing suitable for the purpose is in stock or can be made or reclaimed in the railroad shops at a profit and is assured that when a requisition for the purchase of material is placed, it gives a complete description of what is most suitable for the purpose required, and that if placed to take advantage of existing market conditions, the material will be used in a given length of time. There should be no divided responsibility between the user that is responsible for the expenditure and the storekeeper that orders the requirements and does the accounting.

To properly carry out these principles there must be an efficient organization, ample facilities, and standard methods and practices.

Justice is too frequently overlooked in developing efficient organization. Make justice the reigning force in the organization, and loyalty and character will flourish.

An aim of efficient organization should be to operate as economically as possible, and to do this requires adequate facilities consisting of standard buildings, material racks, material trays, etc., and the adoption of labor saving equipment such as interplant automobile trucking service, locomotive cranes, gantry and overhead traveling cranes, lift trucks and similar equipment that will reduce operating costs.

To attain efficiency it is of vital importance that instructions be carried out; failure to do so is the cause of more mistakes than all other causes combined.

The first essential in maintaining stock and analyzing future requirements is a stock book so designed as to permit maintaining a complete and permanent record of the receipts and disbursements of the material which has been adopted by the railroad as its standard. It reflects stock records in a form that constitutes a perpetual inventory—an arrangement by which the quantity of each item of material can be ascertained at a moment's notice, affords the predetermining of the maximum and minimum quantity desired of each item and lists the exact quantity of surplus or available material for use elsewhere.

The success of a storekeeper in maintaining a good stock balance, depends largely upon his ability to make prompt and accurate requisitions. Requisitions depend upon the counting of material; and the promptness and accuracy of this are generally due to systematic storing, secured by grouping material of the same general class in sections, arranged in the order the material appears in the stock book, and placing the sections in charge of one man, who handles the material from the time it is ordered until it is issued. This practice coupled with standard material racks, gives the storekeeper "a place for everything, and everything in its place," which puts him in a position to make the most of time, space and equipment.

Stores Delivery Proved

It has been said that material has no value, either to the railroad as capital or to the using departments as service, until it has been actually delivered to the points where it is required for use. Stores delivery of material has the following features that are essential to present day storekeeping.

(1) It is the connecting link between the stores department and shop, which represents the largest user of material.

(2) It keeps at work high priced mechanics who otherwise would be idle securing needed material, and also keep costly machines in operation.

(3) It assures accuracy in accounting by providing a means of obtaining a material order for all items issued with the proper descriptions.

(4) It educates the stores department employees to observe the use and abuse of material by bringing them in personal contact with the men who actually apply the material. It assists them to intelligently anticipate and provide for actual requirements and to satisfy themselves that material will be used as intended and also furnishes them information for locating and returning to stock, any items issued for use and not applied.

(5) It assures the prompt return to the store when completed, of material made, finished or repaired in the shops.

(6) It encourages the use of serviceable second hand and repaired material in place of new material and acts as an important factor in utilizing surplus and obsolete material that is available for substitution.

Supply Trains

Supply trains carry and serve the same purpose in connection with supplies for the operating department as the stores delivery does with the shops. It requires the same amount of co-operation, the same advance information of future requirements and the same accuracy in obtaining material promptly. It places the stores department in personal contact with the

In the Lumber Yard of the Southern Pacific at Oakland, Cal.

users on the line. It establishes a close relation between the two and, when it is the custom for representatives from the maintenance of way and operating departments to accompany the train over their respective districts, an opportunity is afforded for a check of conditions on the ground to determine the actual need of material, and a dependable chain of communication is formed between the men on line and division headquarters which secures closer co-operation.

More Reclamation

Almost every department has entered into the spirit of using reclaimed material. The work should come under the jurisdiction of the supply department which is directly interested in seeing that the cost of reclaiming and repairing does not exceed the cost of purchasing new material. It is also in a position to avoid repairing or reclaiming items for which there is no immediate demand and which may become surplus or obsolete.

Accounting

For the most efficient and economical results in material handling, the storekeeper should have immediate access to all records of receipts and disbursements of his stores. Therefore, all accounting should be done by the stores department who handle material on the ground and are entirely familiar with each item and its use.

Improved Conditions

The purchase and stores departments are blessed with a continually improving atmosphere of working conditions and improvements inspired and are nutured by committee reports of Division VI, of the American Railway Association, the creation of which has done more to place the purchase and stores departments of the railroads in their proper position, as an important and specialized department of the railroad organization than anything done in the last 30 years.

Organization and Supervision and the Essentials of Stock Control

By John Robert Stokes

Assistant Division Storekeeper, Illinois Central, Centralia, Ill.

J. R. Stokes

The present-day storekeeper holds a key position in the distribution of material and supplies. The using departments of the railroad no longer consider him unimportant but rather an active member of their organization and are insistent that the working programs are brought to his attention in detail.

Pick Only Men With Promise

Unusual care must be exercised by the supply department when employing new talent and only men who show possibilities of advancement should be considered. To build a successful supply department organization requires years of teaching and the demotion or discharge of an employee after a number of years in service means a decided loss to the railroad. The supply organization is so constructed that the work interlaces and to have one or more in it who are not capable of promotion tends to stagnate or retard the natural progress of those endowed with the ability to go ahead.

The first impression for a beginner should be one of business and every precaution should be taken to make it lasting. It is better to lead than to drive, for in pursuing the former course, a good example must be placed before each portion of the organization. It keeps the supervisory forces alert and requires new constructive ideas, produced by thought and study, to hold the respect of those under their jurisdiction. A good laborer has little respect for a foreman unable to plan work more economically than he could accomplish the same task.

A storekeeper is the vital part of a well organized supply department and should be familiar with the material he is to handle before he is given the position. This important work requires a man who can hold the respect of those directly in his charge. A few months of close supervision should be exercised by his immediate superior before entrusting him to proceed on his own merits. Constant checks must be made by the storekeeper and his subordinates to insure that the material is being properly accounted for in the stock books or records. The amount ordered must be scrutinized closely by the foreman in charge before the requisition or order for more material is made. The adage, "An ounce of prevention is worth a pound of cure," applies to the control of stock.

The art of controlling the investment while giving service to the railroad continues to be the goal of perfection. A storekeeper is gaged by his ability to furnish the material requirements at the proper time and have on hand a clean moving stock sufficient to take care of the territory over which he has jurisdiction. Obsolete and dormant items of material are no longer welcome and although hidden by various accounting reports can no longer exist for any length of time with the present system of stock records and checks that are made monthly and periodically.

Good stockkeeping is good storekeeping and a minute check of each item of material is necessary to an active stock. Changes and improvements, especially concerning rolling equipment, have a decided tendency to make material obsolete but with the stock under control, there is a far better opportunity of disposing of the bulk of any one item prior to the time the change in standards actually take effect.

Co-operation Essential

Close contact with each department and their working program, also with the financial conditions, are indispensable in keeping the proper quantity and correct material on hand. The classification of motive power and freight car repairs at main shops is no doubt a large factor in controlling stock. Long run passenger and freight trains have eliminated smaller repair points, bringing about another reduction in material balances. Keeping material for repairs to practically all classes of locomotives and freight equipment at every shop or roundhouse on a railway system is an expensive investment.

Increasing demands of the public have brought about many changes in the motive power, passenger and freight cars to meet the requirement of quicker transportation at lower cost with higher wages. Mechanical devices, also automatic train stop signals, have been installed on locomotives causing additional expenditures for repair parts to protect this investment. The freight cars are larger and require modern appliances, also changes in construction pertinent to safe operation. Materials for these improvements demand more storage space and racks. It requires planning and thought to arrange the material so that a quick and accurate count can be made for effective stock control.

Increased Responsibility

With all the modern storehouse equipment, racks, records, etc., the human element is still vital. The amount of physical work per man may have decreased but added responsibility on account of the increasing items of material and the savings effected by controlling the stock investment more efficiently have justified the increases in supervisory force.

The supervision of line stocks is important and a stockkeeper or checker should cover his entire territory monthly. Although rail and ties are purchased on contracts and distributed according to programs furnished by the maintenance of way department, care must be exercised to insure that proper accounting is made monthly. Rail fastenings furnished on allotment can be distributed much better by unloading in the supply department material yard and shipping to the work as needed. The same method of distribution can be applied in handling rail and ties where practical to further the interest of stock control.

Executive Interest a Factor

There is a great deal of satisfaction in knowing, rather than merely thinking that the executives of a railroad are keenly interested in controlling the investment in stocks of material. The general officer who makes a thorough inspection of switching yards and premises of the terminals often pauses to pick up small pieces of scrap and serviceable materials overlooked by those employed to do this work. He is not respected by the supply department so much for the value of the material which he recovers but for the lesson he is teaching in stock control.

Motor Transport Division Meets

New Division addressed by R. H. Aishton—Law, motor coach and rail motor car committees report

WITH a morning attendance of 45 railway officers representing some 60 railways, the Motor Transport Division of the American Railway Association opened its second regular meeting at the Traymore yesterday. The morning session was featured by addresses by R. H. Aishton, president of the American Railway Association, and W. H. S. Bateman, president of the Railway Supply Manufacturers' Association, which were followed by the reports of the Law and Motor Coach Committees of the division. In the afternoon, the report of the Rail Motor Car committee was presented.

A. P. Russell, vice-president of the New York, New Haven & Hartford and chairman of the Motor Transport Division, opened the meeting with a report of the results of the meeting of the General Committee of the division on Wednesday. Accepting the recommendation of the General Committee, the convention approved a motion that the next meeting of the division, designated as the annual meeting, be held at Detroit, Mich., in October, probably on Oct. 24-25.

Regional Organization

Mr. Russell described the plan of regional organization of the division, designed to insure full attention to the local problems of all parts of the country. Under this plan, the United States and Canada are divided into seven regions, region No. 1 to include the states east of the Mississippi river and south of the Ohio river; region No. 2, the central western states west of the Mississippi river and south of the Dakotas; region No. 3, the northern section of the central west; region No. 4, the southwestern states, extending to the Pacific coast; region No. 5, the northwestern states, extending to the coast; region No. 6, the middle eastern states north of the Ohio river and east of the Mississippi river; and region No. 7, the northeastern states and Canada. The committees of the three sections of the division will be organized as far as possible to include in their membership representatives of railways located in each of these regions, and regional committees under each section will be organized under the chairmenship of the members of the national committees of the three sections.

Committee Personnel

The national committees of the three sections of the division were announced as follows:

Motor Coach Section—T. B. Wilson, vice-president and manager, Southern Pacific Motor Transport Co., chairman; R. J. Littlefield, manager, motor coach service, Boston & Maine Transportation Co.; F. S. Hobbs, general manager, New England Transportation Co.; G. L. Whipple, general superintendent of transportation, Union Pacific System; M. F. Steinberger, special engineer, Baltimore & Ohio; E. D. Osterhout, passenger traffic manager, Reading; R. H. Clarkson, manager, Santa Fe Transportation Co.; C. B. Foster, passenger traffic manager, Canadian Pacific.

Motor Truck Section—G. C. Woodruff, assistant freight traffic manager, New York Central, chairman; C. J. Chenworth, engineering assistant to vice-president and general manager, Atlantic Coast Line; J. G. Drew, vice-president, Missouri Pacific; W. E. Cooper, assistant to general manager, Chicago, Milwaukee, St. Paul & Pacific; Paul P. Hastings, general freight agent, Atchison, Topeka & Santa Fe; J. P. O'Brien, general manager, Oregon-Washington Railroad & Navigation Co.; M. F. Steinberger, special engineer, Baltimore & Ohio; J. L. Hill, supervising agent, Long Island.

Rail Motor Car Section—R. L. Fairbairn, manager passenger service bureau, Canadian National, chairman; L. B. Burns, assistant general manager, Seaboard Air Line; E. Wanamaker, electrical engineer, Chicago, Rock Island & Pacific; E. W. Lollis, general superintendent, Chicago, Milwaukee, St. Paul & Pacific; G. L. Whipple, general superintendent of transportation, Union Pacific System; H. M. Eicholtz, assistant general manager, Chicago & North Western; J. K. McNeillie, superintendent, Delaware & Hudson.

Welcoming Addresses

At the conclusion of the business session, Mr. Russell presented R. H. Aishton, president of the American Railway Association, who prefaced his remarks by announcing that at a meeting of the board of directors of the association last week, the organization of the Motor Transport Division had been formally approved and the name, Division VIII—Motor Transport, assigned to it. Mr. Aishton emphasized the importance of the exhibit of equipment at the Million Dollar Pier and in Marine Hall and urged its close study. He said in part:

"The railroads will have facing them in the next four or five years in my opinion more problems to contend with than they have had at any time since 1920, and one of their principal problems will be the constantly decreasing net revenues, the constantly increasing cost, the constantly growing forms of competition—motor bus, motor truck, inland waterways, air and all of those things. And in spite of the decreasing revenues they have constantly growing agitation, and a feeling on the part of communities, industry, farmers and particularly of politicians in favor of a still further reduction in revenues.

"Now, there are two ways of meeting that, and on the particular matter which you have in charge, I think depends in very large measure the success with which the railroads can meet competition and satisfy the public; for after all, it is not what the railroads think the people ought to have—it is what the people think they ought to have in the way of transportation service and the form it should take, that is important. And what the people think they should have is going to be governed very largely by the character of service and the convenience and efficiency of service and the cost of service that you are going to be able to give them. And if you can give more efficient service, cheaper service and service that satsifies the public by the adoption or the coordination or the co-operation of service, you are going to make satisfactory your own control of the transportation service of this country.

Regardless of all other forms of transportation, with our vast distances and production, and the demand for quicker efficient and bulk transportation, the railroads have got to be the backbone of transportation in this country, and the public must and should understand, and you should give them to understand, that anything that weakens the efficiency of that backbone of transportation affects not only the railroads and their stockholders, but also every situation in this country and prevents the growth of this country. It will also pre-

vent this country from maintaining its leading rank among the commercial nations of the world.

"I believe that in the next five or ten years, what the railroads are doing today in the matter of transportation will be just as much a backnumber as the Conestoga wagon of years past. The railroads must and will anticipate the development of transportation and so shape their affairs that they can keep abreast of all these movements. That is part of your job.

"A good deal has been said about the antagonistic attitude of the railroads towards new forms of transportation. There is a complete misunderstanding on that matter on the part of the public. The railroads have steadfastly refused to be placed in the position of opposition to the development of any legitimate form of transportation service, either on the water, over the highways or in the air that is economically justified and demanded by the public. The public of this country is entitled to every means of transportation that it wants on this basis. The public ought to know that we are co-operating with any form of transportation demanded in the public interest and if it tends towards the public interest, the railroads cannot afford to take any other position.

"What the railways do contend, however, is that all competing forms of transportation should be treated alike; that when traffic is carried by other means of transportation those for whom it is carried should have to pay rates that will cover all the costs of handling, just as when it moves by rail; and that the same kind of regulation that is applied to the railways should be applied to all common carriers that compete with them."

Following Mr. Aishton's address, W. H. S. Bateman, president of the Railway Supply Manufacturers' Association, welcomed the convention to Atlantic City. Referring to the rapidity of transportation developments in recent years, he said that he would not be surprised a few years hence to see a comprehensive exhibit of airplanes and aeronautical equipment on display as a feature of the railway conventions at Atlantic City.

The Committees Report

R. N. VanDoren, chairman of the Law Committee, presented the report of that group. He described the activities of the committee in preparing a proposed bill to regulate interstate commerce by motor coach, which was introduced by Representative Parker at the last session of Congress. Although this bill was not passed by Congress, Mr. VanDoren said he felt that substantial progress toward federal regulation of motor coaches operating across state lines had been made.

Chairman Wilson took the chair for the presentation of the report of the Motor Coach Committee. The first subject—determining factors in considering the question of the desirability of motor coach operation by a railway—was discussed by Mr. Littlefield (B. & M.). He was followed by Mr. Hobbs (N. E. T.), who reported on the scope of the services in which motor coaches are being used by the railways. Mr. Whipple (U. P.) compared the carrying of liability insurance with the building up of reserve accounts by motor coach companies to handle claim payments. Mr. Steinberger (B. & O.) presented a summary of an exhaustive survey of action taken by state regulatory bodies on applications of railways to operate motor vehicles coordinated with their trains, and also on applications of independents to install competitive highway service. The remainder of the motor coach report was then deferred until today to allow the Rail Motor Car Section to take the floor.

Further proceedings of the Motor Transport Division Meeting will be reported in tomorrow's DAILY.

Conventionalities

Col. R. P. Lamont, president of the American Steel Foundries, recently was elected vice-president for the northern central district of the Chamber of Commerce of the United States.

H. E. Passmore is attending the convention this year in a new capacity. He is now in charge of the Pittsburgh District of the McClave-Brooks Company, manufacturers of stokers and grates.

The many friends of J. K. (Jim) Booth, master mechanic, Bessemer & Lake Erie, will be sorry to learn of the death of Mrs. Booth while on a trip south last fall, where she went in the hope of regaining her health.

A. C. Deverell of the Standard Car Truck Company, is accompanied this year by Mrs. Deverell, it being her first convention for a long time. She was unable to attend the 1926 convention because of an accident which resulted in a broken hip.

Mr. and Mrs. J. M. Fitzgerald, of New York, are among the convention visitors. Mr. Fitzgerald is assistant chairman of the Committee on Public Relations of the Eastern Railroads and formerly was president of the Western Maryland.

If anyone wants good inside information on how to prevent hot boxes get Frank H. Becherer, superintendent car department, Central Railroad of New Jersey, off in a corner. His road has certainly made a record for itself in hot box prevention work.

LeGrand Parish dropped into Atlantic City on Wednesday and expects to remain for several days. He has just returned from an eight months' trip with Mrs. Parish, which took them most of the way around the world. They particularly enjoyed their experiences in Africa.

George Bender, who has attended the conventions for many years past as a representative of Mudge & Co., is here this year in his new capacity as northwestern representative of the Royal Railway Supply Company, Inc., of New York. George is located at St. Paul, Minn.

O. C. Cromwell, assistant to the chief of motive power and equipment of the Baltimore & Ohio, is an enthusiastic member of the Executive Committee of the Baltimore Section of the American Society of Mechanical Engineers. This section has been giving a splendid account of itself in the last few years.

Will somebody please give George Fogg, of the Superheater Company, some salt water soap. George is having great difficulty trying to keep clean with the salt water these Atlantic City hotels furnish their guests. We would suggest, though, as an alternative, that George try the other tap.

J. W. Motherwell, who is here with Mrs. Motherwell, tells us that his daughter, Miss Ruth Motherwell will be here over the week-end. Miss Ruth was graduated from Northwestern University, with the degrees of B. A., B. S. and M. A. She is now teacher of English at the Milton (Mass.) high school.

One of the convention visitors who have taken a great interest in the exhibit is Fred W. Sargent, president of the Chicago & North Western Railway. Mr. Sargent came here from New Haven, where he had witnessed the graduation of his son from Yale University.

In Wednesday's announcement concerning the life members of the Mechanical Division, the titles of Ex-Chairman Sillcox and J. W. Small were inadvertently transposed. These two men, however, are so well known in mechanical circles that there will be no confusion in the minds of those who read the announcement.

Charles A. Benz has been made manager of the railroad department of the Chicago Malleable Castings Company, with headquarters in Chicago, in place of J. H. Slawson, resigned. Mr. Benz is accompanied at the convention by his wife, an Atlantic City girl whom he met while attending a previous convention.

New York Central Hudson type locomotive No. 5216 reports over its train radio connection to the General Electric booth on the Pier, that the man on the locomotive is not Graham MacNamee, but Ray M. Brown, who under normal conditions is superintendent of motive power, New York Central Railroad, at New York.

J. G. Stuart, general storekeeper of the Burlington, and a past chairman of Division VI, is certainly running true to form. In discussing his favorite type of windows for storehouses Thursday morning, he informed the convention that, "there is nothing as cheap as daylight and we want all we can get, because it is free." Mr. Stuart is a Scotchman.

Among the convention visitors that everybody is glad to see is W. P. Dittoe, formerly purchasing agent of the New York, Chicago & St. Louis. Mr. Dittoe has retired after many years of service with the Nickle Plate but is still in the enjoyment of good health and gets as much pleasure as ever from meeting his many friends in the railroad and supply fields.

B. C. Tracy, welding exponent of the General Electric Company, Bridgeport, Conn., who has been hibernating for some time in the southwest, got so far away from civilization that he discovered an enginehouse foreman who did not know what a turntable tractor was. Mr. Tracy started a campaign of education and on his next visit expects to open up the subject of welding.

E. A. Averill of The Superheater Company came to the convention this year by way of Cornell University. His son, Edgar W., was graduated in the liberal arts course, the commencement exercises taking place on Monday. Mr. Averill got away from Cornell about three o'clock on Monday afternoon, stopped at Wilkes-Barre overnight, and reached Atlantic City before dinner on Tuesday evening.

Ralph Cooper, vice-president of the Independent Pneumatic Tool Company, is working under a severe handicap at the convention this year. He can hardly talk above a whisper, having recently attended the twenty-fifth reunion of his class at Cornell, at which there were a goodly bunch of "old grads." Ralph says that despite their ages, they demonstrated how young "old" men can be.

One of the earliest arrivals on the Boardwalk to attend the annual meeting of the Purchases and Stores Division was W. F. Jones, purchasing agent dining car service, New York Central, and a past president of the old Railway Storekeepers' Association. Mr. Jones had the honor of sounding the opening note at a meeting of the railway storekeepers, "way back when," in 1905. He is accompanied this year by one of his sons.

C. M. House is attending the convention for the first time in his present capacity as superintendent of motive power and equipment of the Chicago & Alton at Bloomington, Ill. Mr. House is particularly enthusiastic just now about the possibilities of a system of boiler feedwater treatment being developed on the Chicago & Alton and about shopmen's recreational activities which are working out most successfully at Bloomington.

James R. White, secretary and sales promotion manager of Jenkins Bros., New York City, is attending the convention for the first time and is accompanied by Mrs. White. Prior to his entry into the Jenkins organization, Mr. White was vice-president of Rickard & Company, New York City, an organization of sales and advertising counselors. Cy. Yardley is officially conducting Mr. and Mrs. White around the Pier and Atlantic City.

Cardwell is not a particularly common name and doubtless Thomas Cardwell, of the Cardwell Supply Company, St. Louis, Mo.; may be distantly related to J. R. Cardwell, president of the Union Draft Gear Company, Chicago. Possibly because of the similarity in names, the Cardwell Supply Company was incorrectly shown in the list of exhibitors in Wednesday's Daily as being a Chicago concern, whereas St. Louis is its base of operations.

H. C. Pearce, director of purchases and stores of the Chesapeake & Ohio, is almost equally enthusiastic about two things. One is the remarkably efficient arrangement of the stores on his road, and the other is the interest that he takes in the younger men in the Chesapeake & Ohio organization. He recently attended the fourth annual Younger Men's Conference of the Chesapeake & Ohio and the Hocking Valley, and made a most inspiring and helpful address.

D. C. Curtis, chief purchasing officer of the Chicago, Milwaukee, St. Paul & Pacific, who is attending the meeting of the Purchases and Stores Division, apparently is not content to conclude his distinctions with the honor of being a past chairman of the Purchases and Stores Division, for immediately before leaving Chicago for Atlantic City he was found attending the graduation exercises of the University of Wisconsin, to see the older of his two fine boys graduate from a course in liberal arts.

J. M. Pratt of the National Railway Appliance Company is attending the convention this year in his new capacity as vice-president in charge of sales. Mr. Pratt has had considerable automotive experience and is the successor to W. C. Peters, who has been suffering for the last year or more from a rheumatic condition, which developed during his war activities on the other side. Mr. Peters, it will be remembered, was formerly associated with the mechanical department of the Boston & Albany Railroad.

Among the younger mechanical department at Atlantic City this year is N. K. Hogan, a special apprentice of the Chesapeake & Ohio. Mr. Hogan is one of the members of the AREB Club at Hunting-

ton, W. Va. This club is now engaged in building a miniature locomotive. With the AREB Club at Russell, Ky., its members made an excursion last week to Mammoth Cave. The 30 young men left Huntington Saturday noon and returned Monday morning, stopping off for a few hours at Louisville, Ky.

Another important member of the railway equipment and supply manufacturing fraternity who takes a leading part in the affairs of the national chamber is A. L. Humphrey, president of the Westinghouse Air Brake Company, who is chairman of the chamber's Division of Transportation and Communication. At a time when the railways and the industries that are dependent upon them for their market are confronted with so many important problems, they are fortunate in having men in their field who are so influential in the work of the chamber.

John P. Neff of the American Arch Company, and Mrs. Neff, who is with him this year, are looking forward to the arrival this morning of Miss Mary, their eldest daughter. This will be Miss Mary's first convention experience at Atlantic City. The Neffs are planning on joining the special party which has chartered a Great Lakes steamer in August to take them from Buffalo to Duluth and return, in connection with attendance at the regional meeting of the American Society of Mechanical Engineers in St. Paul, Minn.

W. A. Callison, superintendent of motive power of the Chicago, Indianapolis & Louisville, and chairman of the Committee on Design of Shops and Engine Terminals, has recovered from his recent operation, but was unable to travel to the convention. As a result, the committee report, to which he contributed so much of interest and effort, was read by another member of the committee, B. P. Phelps, engineers of shop extensions of the Santa Fe. General congratulations are in order for the way in which this report was presented and fully discussed on the convention floor.

Mr. and Mrs. H. A. Raider, Tientsin, China, are visitors at the conventions and exhibit. Mr. Raider was for many years a railway man. He is now general manager of the Chinese Engineering & Development Company, with offices in several important cities in China. He is also the representative of the Pyle-National Company in that country. Formerly with the Baltimore & Ohio and Norfolk & Western, Mr. Raider has lived in China since 1909, when he became associated with the Canton-Hankow Railway. Later he entered the railway supply business.

An endeavor was made to find out how long Ben Hegeman, a past president of the R. S. M. A., has been attending these conventions, but it was impossible to find any one with a memory long enough. He started in the old Saratoga days and has been associated with the railway supply industry constantly since that time. With his present organization, the National Railway Appliance Company, Mr. Hegeman has followed the trend of the times by developing an extensive line of motor coach products. Harold Hegeman, his son, has been associated with him for the past 20 years.

A former convention visitor who is greatly missed this year is Walter Leach, until his death recently president of the Hunt-Spiller Manufacturing Corporation. For some years Mr. Leach was an invalid and had to spend his time while attending recent conventions in a wheel chair, but his death nevertheless was a shock to his many friends. He has been succeeded as president of the Hunt-Spiller Manufacturing Corporation by J. G. Platt, formerly vice-president of the company and for many years one of the most energetic and efficient workers in the Railway Supply Manufacturers' Association.

Julius E. Shafer, president of the Shafer Bearing Corporation, is an interested visitor at the conventions. Mr. Shafer and the officers of his company, eight in all, flew from Chicago to Atlantic City last Monday and they had an enjoyable trip, although a heavy fog at an altitude of 6,000 feet over Ohio added a bit of a thrill to the journey. They also enjoyed the distinction of riding in the first four-motor plane arriving at the Atlantic City air port. The Shafer roller bearings are being shown in connection with the American Steel Foundries exhibit on the Pier.

In accordance with his usual custom, Silas Zwight, general mechanical superintendent of the Northern Pacific, is present this year with a substantial representation of members of his staff. One of the interesting things Mr. Zwight is doing in conjunction with the American Locomotive Company is the development of a locomotive design which will be outstanding in several respects. It is said to be the largest steam locomotive yet considered, being of the four-cylinder, simple, 2-8-8-4 type, with a total tractive effort of 150,400 lb. and a weight, including tender, in excess of one million pounds.

An interested attendant at the convention this year is J. E. Irwin, of Sand Springs, Okla., who has the distinction of being master mechanic on probably the only railroad in the country owned by an orphan asylum. Sand Springs Railway has 32 miles of track with 7 miles of double-track main line. Both steam and electric operation are employed, the motive power consisting of five electric locomotives and two steam locomotives. A total of about 62 passenger, freight and miscellaneous cars are owned. Mr. Irwin, accompanied by Mrs. Irwin, is stopping at the Princess Hotel.

W. S. Morris, with the American Locomotive Company at Atlantic City this year, has the distinction of being a son of a former president of the American Railway Master Mechanics' Association. His father, the late W. S. Morris, formerly superintendent of motive power of the Chesapeake & Ohio, was president of the Master Mechanics' Association during 1900 and 1901. The younger Mr. Morris, since graduating from Annapolis about five years ago, has been with the American Locomotive Company and is now associated with Norman C. Naylor, district sales manager of the American Locomotive Company and the Railway Steel-Spring Company of Chicago.

James Partington, manager of the engineering department of the American Locomotive Company, is here for the first week of the Mechanical Division meeting. Mr. Partington is taking justifiable pride in the fact that his son, Philip F., has just completed his first year at Yale, carrying off the honors as the top man in the freshman class in breast stroke swimming, as well as being a member of the Dean's Honor List. James Partington, Jr., has just completed his second year at Haverford College and this summer will work in the civil engineering corps of the Delaware, Lackawanna & Western. Mr. Partington was chairman of the Nominating Committee of the American Society of Mechanical Engineers, which recently nominated Elmer A. Sperry for the presidency of that organization.

Electrical Engineers Meet at the Dennis

Progress reports of committes and interesting discussion mark well-attended semi-annual meeting of A. R. E. E.

THE semi-annual convention of the Association of Railway Electrical Engineers was held in the Ozone Room of the Hotel Dennis yesterday morning. In the absence of the president, E. Marshall, electrical engineer of the Great Northern, the meeting was called to order by the first vice-president, J. L. Minick, assistant engineer, Pennsylvania Railroad.

As is customary at the semi-annual meeting, the several committees of the association presented progress reports of the work being undertaken by them. Most of these reports were short and in some cases no discussion followed. The first report presented was that of the committee on illumination.

Illumination

The progress report of the committee on illumination was brief and consisted of a list of subjects which the committee proposed to include in its annual report. Necessary revisions in the manual, developments in incandescent lamps for train and locomotive service, presentation of lamp schedules and consideration of the preparation of the standard specification for incandescent lamps, were mentioned.

The committee also stated its intention of continuing the study of floodlighting as applied to railroad use. In connection with this latter subject, the chairman, L. S. Billau, assistant electrical engineer, Baltimore & Ohio, pointed out that since the railroads were only one group of floodlight users, certain specifications for the testing of floodlighting units would not be especially valuable unless generally adopted by other users. The report was accepted as a progress report.

Electric Welding and Heating

The report of the committee on electric welding and heating was presented by E. Wanamaker, electrical engineer of the Rock Island, the report summarizing the activities of the committee. Revision of the manual is being considered for presentation at the fall meeting, the changes consisting of a revised code of general rules for electric and autogenous welding. The committee sought discussion concerning the means of excitation of welding generators and upon the desirability of using rubber tires on portable welding equipment. It was recommended by the committee that a study of the development of electric welding be made with special regard to railway requirements.

Although the committee stated that it had confined its efforts to welding practices, it was indicated that the addition of plating to the manual would be considered and reported upon.

In amplifying the report, Mr. Wanamaker pointed out the necessity for the electrical engineers concerning themselves with the design of electric welding equipment, stating that they should be acquainted with the general efficacy and usability of the devices as well as their electrical efficiency.

Discussion.—In the discussion which followed Mr. Minick brought up the subject of welding machine sizes, stating that there was a tendency on some roads to get away from the multi-man machine and to use single-man outfits. He further said it was almost impossible to compare the ratings of machines made by different manufacturers as these varied so widely even when supposedly the same.

J. E. Gardner, electrical engineer, Chicago, Burlington & Quincy, said he was glad to see the committee had taken up the subject of automatic welding machines. He cited one instance of a shop-made automatic welder that had been devised by a master mechanic who was using it for building up car axle collars. By using a continuous welding wire an appreciable saving was effected over the old methods where short lengths of welding wire were necessarily discarded.

Self-Propelled Vehicles

The progress report of the committee on self-propelled vehicles was also presented by Mr. Wanamaker. The committee reported that it was impossible to arrange with other manufacturers to prepare instruction books since the three companies which are producing most of the gas-electric cars have completed their instruction books in a manner satisfactory to the association.

Standardization of lighting for rail cars was a subject which the committee felt it would be better to leave until 1929, but the matter of operating and maintenance costs was considered more important. The committee proposes to submit a standard form, or perhaps several forms, for keeping operating and maintenance costs, as used by different roads so that these may be freely discussed at the fall convention.

Discussion.—In discussing the report Mr. Wanamaker emphasized the importance of the electrical engineers familiarizing themselves with the three types of gas-electric rail cars which are now available, pointing out that large sums of money would be spent for equipment of this type and that the electrical engineers would undoubtedly be called upon to make recommendations concerning the purchase of one type or another.

Mr. Minick called attention to the fact that the railroads were passing through a period that requires careful consideration of self-propelled equipment. By means of self-propelled cars traffic which has been going to other forms of transportation may be again recovered for the railroad.

Power

In the absence of the chairman of the Committee on Power, the report was presented by the secretary, J. A. Andreucetti, electrical engineer, Chicago & Northwestern. When the final report is presented at the fall meeting it will cover, first, the correction of last year's report by substituting the standard form of heat balance to show, first, the heat absorbed by the boiler; second, analysis of the

sources of loss which includes seven items, some of which are preventable. A study will be made to minimize the preventable losses. A study will also be made regarding the best practical ratio of furnace volume to the grate surface. No attempt will be made to consider all of the special problems of the large central stations as the committee does not feel that the plants of steam railways are in this class. The question of shutting down furnaces during the summer months is being considered as well as the consequent use of electric fans for producing forced draft. A study of the waste of steam after its production is also being made and the question of purchased electrical power is being considered.

Discussion.—A lively and lengthy discussion followed the presentation of the power report. Practically all of it, however, was concerned with the subject of purchased power, dealing almost exclusively with the meter power contracts between the railroads and commercial power companies. A number of interesting phases of this subject was freely discussed. Mr. Gardner told of one method in practice on his road to keep down the maximum demand charge; it was to operate the crane for moving locomotives during the noon hour when the other equipment was idle. He also mentioned the practice of doing pumping as much as possible at night in order to avoid a penalty load during the day.

C. R. Sugg, electrical engineer, Atlantic Coast Line, complained that it was not fair for a single 15-min. peak to determine the power demand rate for a period of six or seven months succeeding. He said he felt the railroads should not be obliged to pay for something they did not get.

Mr. Wanamaker insisted that there was a lot of "hocom" in the power contracts anyway, while Mr. Andreucetti stoutly contended that the power contracts were not so bad if one approached the subject understandingly.

It was nevertheless apparent from the divergency of opinion that power contracts were far from perfect and the committee will give this particular question more consideration for the fall meeting.

Motor and Control Equipment

In a brief report, G. C. Moores, engineer of construction, Baltimore & Ohio, chairman of the Committee on Motor and Control Equipment, outlined the purpose of the committee as follows: To study and report on the application of motor control to various types of shop machines, such as turntables, wheel lathes, shears, punches, etc.; to formulate instructions for the maintenance and test of electric motors and control and to develop a general purpose specification for motors and control with recommended form to be used in ordering apparatus.

Discussion.—In the brief discussion which followed, Mr. Minick stated that the outlook for the standardization of certain physical dimensions of motors, such as bolt hole spacing, frames, size of shaft, etc., was particularly bright. Mr. Gardner and Mr. Sugg drew attention to the simplification of the control of a. c. motors showing the growing practice of starting the larger size of these motors with across-the-line starting equipment.

Train Lighting

The report of the Committee on Train Lighting was presented by P. J. Callahan, supervisor of car and locomotive electric lighting, Boston & Maine. Mr. Callahan said the work of his committee had been divided up into a number of sub-committees handling the following subjects: Lighting parked Pullman cars, application of electric marker lamps to electrically lighted trains, electric power for refrigeration of club, diner and business cars, axle pulley bushings and the elimination of sleeve bushings, operation of fabric faced pulleys, development of locomotive train lighting, and possibility of permanent train line connectors.

Discussion.—The discussion was confined to a few remarks from Mr. Sugg who stated that he had used permanent train-line connectors and found them very satisfactory.

Locomotive Electrical Equipment

Roy Liston, mechanical inspector, Atchison, Topeka & Santa Fe, presented the report of the Committee on Locomotive Electrical Equipment. Mr. Liston stated that his committee was composed of two sub-committees, one of which was handling the matter of preparing a specification for conductors for use on locomotives, and the other was concerned with the cost of maintenance of train control and train stop systems. As chairman of the sub-committee, G. W. Bebout, electrical engineer of the Chesapeake & Ohio, enumerated several points which this sub-committee expects to consider. Among them is a unit cost to be established for the cost of train control maintenance and the determination of the proper account in which this charge should be placed. A division of maintenance expense of turbo-generators, between train control and locomotive lighting, is being considered, a proportion of 50 per cent each being suggested. There was no discussion.

Radio

The report of the Committee on the Application of Radio to Railroad Service was also presented by Mr. Liston, who told of two inspection trips of the committee. One of these visits was to inspect the equipment installed on New York Central trains. Details of the inspections were not given, but were promised for the fall meeting. Mr. Liston did say, however, that the results were satisfactory and prophesied an early utilization of this new factor in train operation. There was no discussion.

Japanese Engineman with Mask Worn When Running Through Tunnels

Scrap Handling on the Pennsylvania

The Purchase and Stores Division Continues Meeting

Featured by presentation of winning papers in the annual essay contest——— Movies shown on delivery of material

YESTERDAY'S session of the Purchases and Stores Division opened promptly at 9 o'clock with an attendance of about 300 which increased during the day to over 450. As a result of the unprecedented amount of work and discussion at the first day's session, which continued until 2.00 p. m., the discussion of the report on control material requirements and the report on stores facilities, scheduled for the first day was carried over and constituted the initial work of yesterday's session. This was followed by the regular program, the feature of which was the presentation of the winning papers in the Division's annual essay contest, by an address on freight claim prevention, and by moving pictures and stereopticon slides on material and scrap handling. The latter supplemented reports on these and other subjects of concern to the railway supply organizations.

Control of Material and Supplies Requirements

Purchase budgets advocated to avoid surplus stocks——— Methods described and compared

R. C. Harris
Chairman

Past experience indicates that unit records of past consumption are indications of future needs. Since stock records may not be conclusive in themselves an additional safeguard should be provided by the advance preparation of money values covering prospective purchases, to be used as a check against the unit quantities produced from the stock book records.

Two methods have been in use on railroads for more than three years. Each method has proved useful and effective in controlling purchases. The methods differ in the manner in which they are administered, as shown in the following comparison:

The Pennsylvania Plan

Maintenance budgets by departments are made available to the supply departments as quickly as possible after being authorized by the management. The supply department then determines the money value of material which must be purchased to meet the requirement of the maintenance budget and that amount is designated "Operating Need by Purchase." This amount is determined by a formula prepared from a study of past performances, as explained in Exhibit "A". After this amount is determined, it then becomes necessary to decide whether any of this amount can be taken from the existing material account and the stock account reduced. If it is decided to reduce the material balance by an amount, say $100,000, that amount must be taken from the "Operating Need" and the result will be "Allotment for Purchase." The central bureau then determines how that amount of money can be apportioned to the various classes of material and translated into units for ordering. Since it is possible to reduce these operations to a formula by a study of existing data, the actual labor of arriving at the necessary information each time a budget is prepared is reduced to a simple operation.

The result is a method which gives the following:

(1) Total value of materials to be purchased in a month.
(2) A percentage of increase or decrease to be applied to the actual consumption in units during the preceding three months to produce the total value of purchases desired.

Exhibit A

Assume that a budget of $6,000,000 has been authorized for maintenance of equipment expenses for the month of July, 1928. On June 25th it becomes necessary to determine what amount of money must be spent for materials to fill the requirements under that budget without increase or decrease in the material balance. From past experience a ratio must be found showing the relative value of purchased material actually required to the total maintenance of equipment expenses. Assume that during the preceding three months the average maintenance of equipment expenses have been $6,400,000, the receipts by purchase have averaged $2,450,000 and the material balance has increased

$150,000. The following method may be used to determine the ratio of purchases as they should have been made:

Actual receipts by purchase	$2,450.000
Increase in material balance	150,000
Operating Need by Purchase	$2,300,000
Ratio of $2,300,000 to M. of E. Expense ($6,400,000) = 36%	
Proposed Budget for July	$6,000,000
Allotment for Purchase—36%	2,160,000

From the fact that the material balance increased during the period in review and the fact that the budget for July is less than the actual expenses for the preceding quarter, it is evident that the purchases for July must be less than the average monthly purchases for the preceding period. In most cases it is impossible to select any particular items of material which could bear this reduction better than others; therefore when other data is not available, it is safe to assume that the average consumption during the preceding three months may be reduced by a percentage equal to the decrease in the budget, in this case $6,400,000 minus $6,000,000 equals $400,000 or six per cent. Therefore the average consumption as shown on stock books for the preceding three months reduced by 6 per cent. should form a proper basis for orders after considering the "on hand" and "due" figures. This method may be used where definite bills of material are not available, which means the larger part of all maintenance operations.

The Milwaukee Plan

Maintenance budgets by departments and locations are made available to local supply officers through local maintenance officers. The local supply officers, after conferences with the maintenance officers, prepare an estimate of the value of materials which they must acquire to meet the local maintenance program of work. This estimate is submitted to the central supply bureau where a consolidation is prepared and compared with the total maintenance budget for the railroad. A decision is then reached as to what changes are necessary in each local estimate and an allotment given each local point for the total value of the material which that point can order. The method of arriving at unit quantities is similar to that described in the first method and is illustrated in Exhibit A.

Exhibit B is a form suggested for compiling the estimates of the local supply officer, usually the division storekeeper and Exhibit C is a form suggested for distributing the authorized amounts to the various local stores.

The first plan contemplates centralized control by the budget. It necessitates the fixing at headquarters of the relationship between units and money values whereas the second method transfers to local stores that action. The second plan is practicable where the user of material has a local expense budget and the local supply officer has the data for determining the units which may be necessary to carry out that budget. The plan of budgeting expenses locally has not been developed on all railroads and except where that is done, it will be difficult if not impossible to apply the second method.

Any plan of control which necessitates a general reduction of orders at headquarters is fundamentally unsound because of the removal of responsibility from the local officer for making decisions as to the quantity of material he requires for his operations in his territory. For this reason the central bureau

DEPARTMENT	By PURCHASE	From DISTRICT STOREKEEPER	From RAIL MILL	From FROG SHOP	TOTAL
LOCOMOTIVE					
CAR					
TRACK					
B. & B.					
AGENTS					
SIGNAL					
STATIONERY					
FOUNDRY					

NOTE.—Perpared by the division and district storekeepers and forwarded to the General Storekeeper.

Exhibit B—Form of Compiling Estimates of Local Officer

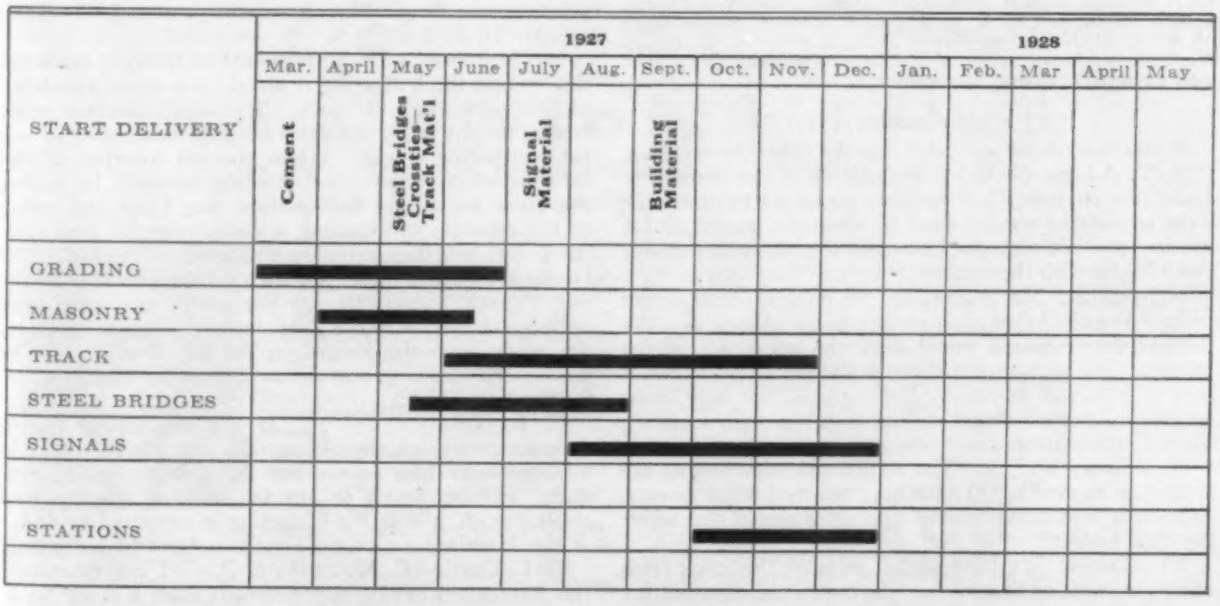


Exhibit D—Form of Recording Progress of A. F. E. Work

for censoring orders before purchases are actually made should work on the same basis as the originator of the orders, that is, the amount of money to be spent in maintenance in each territory must be known by the censoring bureau so that controversies over quantities ordered may not be frequent.

The effectiveness of the allotment for purchase plan depends upon the way in which the budget is observed by the maintenance officers. A loosely observed budget destroys the benefits which might be realized from an allotment for purchase, increases the material balance if the operating budget is underspent and causes shortages of material if the operating budget is overspent.

Material for A. F. E. Work

Since much of the material for new work can rarely be used economically if not used in the work for which it was ordered, an especially efficient method of control is essential. It is the control which is probably most difficult to obtain because it means a censorship of orders for material prepared from plans in the hands of specialists. The supply department must have the co-operation of those specialists in determining whether surplus special material on hand cannot be used in the work and thereby prevent purchases, but more especially having the time of delivery coincide with the progress of work so that the material may be delivered in proper sequence and not an unreasonable time in advance of its need. The supply department has a definite responsibility in bringing to the attention of the using department every known plan whereby this delivery may be co-ordinated more closely with the needs.

Conclusions

It is recommended:

1. That a representative of the supply department be assigned to all A. F. E. work where the magnitude of the work justifies, to control deliveries and to exercise the supervision over orders which may be necessary to adjust purchases quickly to changes in plans or to changes in the progress of the work.
2. That allotments for purchase be fixed monthly and that maintenance officers be requested to prepare maintenance budgets not less than one month in advance in order that orders for material may be prepared more intelligently.
3. That for the purpose of quickening deliveries, and thereby reducing stocks, prearranged contracts be made for the purchase of standard materials wherever practicable.
4. That allotments for the expense portions of new work projects be provided at the time the projects are authorized because of the delay in the application of material sometimes encountered after material is delivered, due to the fact that expense money is not available for the completion of the work.

The report is signed by: R. C. Harris, (chairman), general storekeeper, Penn.; J. J. Bennett, purchasing agent, I. C.; J. U. King, general storekeeper, A. C. L.; F. W. Mahl, general purchasing agent, S. P.; J. V. Miller, asst. general storekeeper, C. M. St. P. & P.; C. K. Reasor, asst. manager of stores, Erie; C. L. Wright, general storekeeper, M-K-T.; D. W. Corcoran, general storekeeper, C. & N. W.; L. P. Krampf, supply agent, M. P.; R. M. Nelson, purchasing agent, C. & O.; G. M. Betterton, asst. purchasing agent, S. P.-T. L.; Wm. Davidson (chairman ex-officio), general storekeeper, I. C.

Discussion

It was moved and seconded that the report be accepted.

B. T. Adams (I. C.): In Exhibit A the committee states that on June 25, it becomes necessary to determine what amount of money must be spent for materials for use in July. We cannot reconcile the quantities in our stock books with the budget if we wait that long.

Mr. Harris: Mr. Adams has hit on a very important point. We cited that example as one we often meet. We thought that example would show the worst side of the budget. We recommend that the budget be prepared at least a month in advance. But suppose you only know conditions a week ahead. That is better than knowing them 15 days after.

O. Nelson (U. P.): The recommendation is that the budget be worked up 30 days in advance of requirements. Supposing that deliveries are slow; how would that affect the final budget?

Mr. Harris: We have to fall back on the stock book record in cases of that kind. The committee does not for a moment want to substitute the budget control for this stock book control.

J. G. Stuart (C. B. & Q.): Did I understand that Mr. Harris was talking of purchasing on 30 days' notice?

Mr. Harris: No. The point is in one correcting the past performance, 30 days ahead. We must prepare more than 30 days ahead, but just as soon as we know what the budget for the maintenance expenses are to be, then we correct our past action by a new budget in the light of the latest information.

Mr. Stuart: That might be all right if you already had the material on hand but it would be mighty poor if you had to go out and buy the material.

Mr. Harris: The budget does not affect the results where you have had to anticipate ahead of the period for which you have information. Your stock book is then called into play.

Mr. Stuart: I don't like the idea of letting the thought go out from this meeting that 30 days is enough; if we do, someone is going to say, "Your division said, 'Give us 30 days' notice and then we will get your material'." We know we can't do it. The man who is going to do a job should give us a bill of material in advance, not for 30 days but for the whole job, and possibly he might give some dates as to delivery. So far as delivering the material from the yard or from the house, 30 days is abundant, if we have it on hand, but not if we have to go out and get the material. I am strongly in favor of specifying a longer period.

U. K. Hall (U. P.): It would be interesting to know if the committee developed information as to how many roads are actually using the budget control of material.

Mr. Harris: The committee did not develop this information definitely. We only know of four roads. Perhaps there are many others.

J. W. Gerber (Southern): We are using the budget system in a modified form. Our appropriation is made for labor and material in the shop. We receive that appropriation, we receive the figures for it, and we use that partly as information in making our requisitions for material, as far as we can use it.

The Chairman: Representatives of railroads who have this budget system in effect as recommended by last year's committee and this year's committee please arise.

The following gentlemen arose: W. S. Morehead (I. C.); B. C. Hart (N. Y., N. H. & H.); J. W. Gerber (Southern); R. C. Harris (Penn.); and J. T. Kelly (C. M. St. P. & P.).

Mr. Morehead (I. C.): It should be brought out more clearly that the budgeting is merely one other assistance of the controlling of stock. It doesn't displace stock books, or any other method we may now have in use for controlling stocks. When you get together all the information you have for ordering material by asking the users for all the information they have, and going to the records, and making a comparison of past consumption, you then estimate what will be needed. But business conditions may not warrant the purchase in the next month. Even though the work was authorized with good intentions, it may be necessary to hold up the work. So the budget, to be effective, should be used merely as another aid to determine what the requirements will be.

C. B. Tobey (L. V.): If the mechanical people (speaking only of shop material) will give 30 days in advance some idea as to what their shop working program will be, won't it aid in planning the material requirements just as the budgeting is supposed to do?

Mr. Harris: Exactly. That is a form of budgeting.

D. C. Curtis (C. M. St. P. & P.): I can remember the time when hardly any railroads used a stock book. I know that right now all the railroads don't use the A. R. A. classifications of material and scrap. If we

have something that is going to help us progress, we certainly should take advantage of it. We shouldn't stand still and consider the stock book as the alpha and omega. Budgeting may not be the means of making the most progress, but it is going to help. There is still by far too much money tied up in material stocks on the railroads of this country, and we must find some means of reducing that stock.

Wm. Davidson (I. C.): I want to correct the records in regard to the use of the word "budget." I wish that word could be eliminated from the records. This committee in its work has never used the word "budget." The word is "allotment." The allotment system is based on the same principle you follow in your domestic affairs. That is the way the railroads handle it. We figure out how much we are going to spend. We don't figure, as the report would indicate, less than 30 days in advance. We have to look ahead 30, 60, and 90 days on some of this. That is what a storekeeper is for. Don't let's put the responsibility of this on the mechanical department. Of the material carried, we are responsible for 75 or 80 per cent. It is just standard, staple stock. The other 20 or 25 per cent consists of specials, which nobody can anticipate. That special material is not included in this allotment. I remember when I used to sign requisitions as general storekeeper—and everybody else has had the same experience. I only watched the quantities. I never watched the dollars. There are a lot of entanglements you have to consider, but by watching the money, you are going to get some gratifying results. We have to buy lumber, and pile it for treatment, three, four, or five months in advance. I know what time of the year we are going to buy that. I sit down with our purchasing officer, and say, "The month after next I will have to have some more money," and he will make that allotment and we will stick to it. That allotment has been the best thing that I have ever seen in helping the storekeeper maintain his stock, and at the same time give deliveries and watch his prices, and other things.

B. C. Hart (N. Y., N. H. & H.): I receive a list of all the A. F. E. appropriations and entries for the mechanical department material five months in advance. Three months in advance, I get a preliminary report of each one of those entries. It is working out fine, and has been for the last five years.

Mr. Stuart: I know that every railroad represented here is using something of the allotment or the budget system. Every one of us is making an effort to find out when the man who is going to get material from us wants that material, and if he will tell us that, I think it will be just about the same as this allotment or budget that we are talking about. We want our using departments to get closer to us, or we want to get closer to the using departments so that we will know what is wanted, and when it is wanted. If we can get better information than we are getting, we will do better work. Every one of us is getting some of it, but not one of us is getting enough of it.

Mr. Tobey: We do not use the term "allotment" or "budget" in any sense, but I think we are controlling our stock balances just as closely as any other railroad here. We do that mostly by close co-operation with the using departments. We receive from them, usually 30 days in advance, their working program, and know just what they are going to do, and just how many days they are going to work, and we scale our material requirements down or up accordingly. All divisional storekeepers attend every division staff meeting and all of our local storekeepers every morning attend a foreman's shop meeting. In that way they keep in as close touch with the material requirements as you can in any other way.

Mr. Curtis (C. M. St. P. & P.): Mr. Aishton has said to us that the decrease in revenue on railroads is alarming. They are commencing to look ahead. The car service division is looking ahead for 90 days on the distribution of cars. Some of the railroads have a financial statement that looks to the revenues and the money that they are going to spend for six months to twelve months ahead of the time that it is going to be spent. We fellows have to find out, by an allotment or budget, or something else, the money that we are going to spend for the material.

There is not a storekeeper in this room but what has had a lot of material dumped on to him that he has carried for months and for years because those programs have been abandoned and nobody has known the amount of material that was in them or the amount of money that was going to be spent for that material. Nor have the managements been sufficiently educated to know the amount of money that we are going to spend months and months ahead of the time that it is going to be used. This allotment plan is simply to keep uppermost the amount of money that you are going to spend. Then you will have some control of it.

A motion to change the report was put to a vote and lost, and the report was finally accepted as read, and the committee dismissed.

Buildings and Facilities for Handling Material

Give more attention to design and location of buildings———Make supply officers party to all plans

J. L. Sullivan
Chairman

All store buildings should be either of fireproof or fire resisting construction. The width should not be wasted by excessive aisleways. The height is contingent on the type of rack and the windows used, but should not exceed that required for proper light and ventilation. The space between the top of rack and ceiling is useless for storage.

Windows between the racks preclude expansion or contraction. Transoms or overhead windows allow ample wall space but require more room overhead. The most satisfactory arrangement for ample lighting with no restriction on expansion is the use of factory type windows not more than four feet from the floor.

Handling material on other than car floor levels is expensive. Where ground is available, and floor space does not require too much area, the most satisfactory arrangement is one floor at car floor level with offices on the second floor. Basements are costly unless the building site requires filling to a considerable depth. Where more than one floor is necessary, it is much cheaper to build higher than to excavate, especially where basement work would require waterproofing.

Gravity conveyors save power and man hours if installed where the volume of business warrants.

Racks of either metal or wood will answer all purposes, providing they are of the open type and painted inside to reflect the greatest amount of light.

Oil Houses

The oil house has been the most neglected of all stores buildings. They should be of fireproof construction. Storage tanks are more economically handled below the car floor level, as they can be filled by gravity and the oil distributed by pumps or air. The air system of oil handling has worked successfully.

The oil house, like the main store, should be built at car floor level, and, if possible, subdivided into four separate units, two at car floor level and two below, with ample platform on one end to handle empty drums. The building should contain a pump and supply room separated from dry waste storage by a fire wall, and beneath these rooms the tank room should be placed. The space below the platform is recommended for a paint storage room which should be separated from the tank room by a wall.

One Floor Lumber Shed—Union Pacific

At small local points a combined store and oil house is recommended, with the tanks in a fireproof room beneath the store platform and the pumps located at the delivery counter.

Painting should be given the same consideration as the main store,—a light color for walls and ceiling, and aluminum for the tanks as this color is more serviceable than white paint.

Lumber Sheds

Little attention has been paid to the design of lumber sheds. The best results can be obtained if the sheds are built to take care of the lumber in multiples of the most popular sizes; for example, 22, 32 or 42 ft. wide over all. They should be no higher than will permit the stacking of lumber to the highest point reached safely from the floor of a car, and the unloading should be protected by a roof extending over the edge of the car.

Concrete should be used for all foundations, with a two-inch wooden floor placed at least ten inches above the ground, and laid with a one-inch space between the boards to permit ventilation.

Sand and gravel bins are usually built of heavy timbers. The committee recommends a type which is made by setting steel rail

Open End Type Steel Racks—C. B. & Q.

on end in concrete, with boards chamfered on the edges to slide between the base and ball of the rail. The rails should be placed four feet apart web to web.

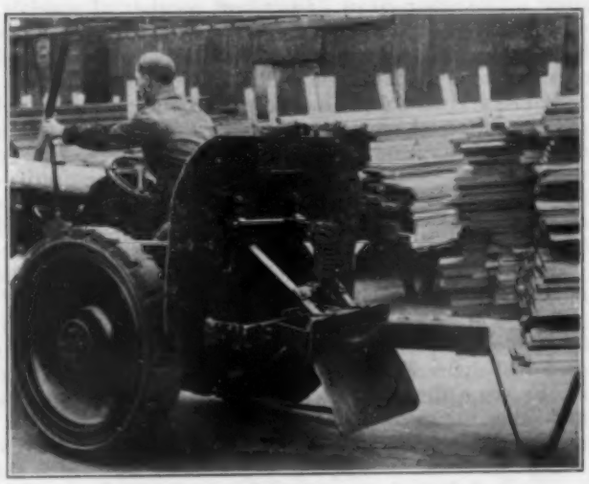
Labor Saving Devices

Labor saving devices should be thoroughly investigated. Automotive equipment, lift trucks, movable platforms, trailers, etc., are gradually replacing hand trucks and truckers. To efficiently operate such equipment, paved roadways are indispensable. Overhead traveling or gantry cranes for the handling of castings, lumber and scrap are demonstrating their efficiency and economy.

By the use of roller conveyors in lumber yards dimension lumber can be handled any distance from a car, saving switching and rehandling. This device can also be successfully operated in connection with the handling of brick, track fittings, bolts, spikes in kegs and similar materials which would have to be handled by hand trucks.

In all modern business institutions inter-department deliveries of mail are handled through pneumatic tubes. The stores can use such an arrangement between the office, section storekeepers and shipping departments. Many hours can be saved by delivering mail or shipping instructions as soon as received instead of waiting for messengers to make their regular trips.

The location of stores buildings has not been given proper consideration in the past. The main idea was to locate the shop and roundhouse, and then crowd the stores department into what was left. Fortunately the storehouse is being given its proper place in new terminal plans. The chief supply officer is the one most vitally interested. His experience is valuable, and when a building is being designed his views should be considered in connection with the general arrangement, type, length and width, vaults, toilet facilities, office space, fire fighting equipment, etc., as well as the amount of space and facilities necessary to handle material stored in the open.



Tractor with Automatic Coupling—Southern Pacific

The report is signed by J. L. Sullivan (chairman), general traveling storekeeper, U. P.; W. E. Rawson, division storekeeper, Penn.; W. C. Hunt, general traveling storekeeper, A. T. & S. F.; J. C. Gann, inspector of stores, M. P.; J. C. Vanderbosch, district storekeeper, B. & O.; A. B. Lackey, division storekeeper, Sou.; G. A. Goerner, storekeeper, C. B. & Q.; W. E. Ruston, storekeeper, B. & M.; H. M. Smith, asst. general storekeeper, N. P.; G. E. Scott (chairman ex-officio), purchasing agent, M-K-T.

Discussion

R. L. Agner (Southern): Can the committee give the approximate cost of cement roadways, or any other improved paved roadways it recommends?

G. A. Goerner (C. B. & Q.): Approximately $1.20 per sq. yd. That is an average cost of concrete roadway.

W. S. Morehead (I. C.): You can't put down roadways for $1.20 per sq. yd. that will stand up under heavy usage. They will cost nearer $3, without the grading. The roadways that we put down, with the grading, cost around $4.30.

Mr. Goerner: Four dollars a square yard is expensive for tractor usage only. If you are going to use them for heavy trucks, that is a different story.

Mr. Morehead: The majority of the wheels on trailers are from 21 to 26 in. in diameter. We are putting on those trailers from two to five tons. That is much harder on the road than if you put a five-ton street

truck on them. If we put our loads on a small wheel, we can't use cheap roadways.

E. H. Polk (S. P.): It is important to consider two widths of roadways. We have, first, the main arteries about the shops, over which it is going to be necessary, in case of fire, to bring city fire-fighting apparatus into the yard. The city firetrucks require at least a 16-ft. roadway on which to pass. For roadways over which to operate tractors eight or ten feet is sufficiently wide.

The committee has recommended that we should consider the location of windows. We had this forcibly demonstrated on the Southern Pacific within the last year. We built a new stationery store, and in its construction the stationery storekeeper developed that it was not necessary to have a running-board on the racks. On the strength of that development, we built a car material store in the last year, and in it we also eliminated the running-board, which means an immense saving in floor space. We have another store in which, we would have taken the running-board off of the racks, but could not because of windows between the aisleways.

Mr. Morehead: The report should read "Width is dependent on the volume of business." We should leave out the words "feet should not be wasted by excessive aisleways." I would rather say, "Be careful to get the aisleways wide enough." If the store is wide enough, where you have two aisles longitudinally, the main aisleway should be at least 10 ft. wide. Between the bins, 2½ ft. to 3 ft. is wide enough. The trucking aisles should be wider.

J. C. Baker (Southern): Does the oil storage, provided for in the basement, include the barrel storage also, or do you recommend a ramp outside for that?

Mr. Sullivan: The barrel storage should be underneath the platform, where the paint store is.

Wm. Davidson (I. C.): I fully agree with the Southern Pacific about windows. There have been a number of mistakes. The factory type of window is satisfactory. I am using the factory type window, when I can.

I should like to know if anyone ever got any good out of an air pressure system of drawing oil.

E. H. Hughes (K. C. S.): We have been handling oil by air for the last 15 or 16 years. We have had no trouble with it and won't go back to anything else.

Mr. Davidson: My experience has been just the opposite. When I went to turn on the faucets of the valves, I would get water in the oil.

Mr. Baker (Southern): If that storage for paint was on the ground floor, or even at box-car height, it would be an advantage over having a basement storage.

Mr. Sullivan: The basement is to protect the paints and oils and the barrels, to keep the barrels together, to prevent leakage and evaporation.

J. W. Gerber (Southern): You could do that on ground level just the same as you could by putting it in the basement. I make a motion to strike out the recommendation of the committee that paint be stored in the basement. We have built ten new plants during the last five years on the Southern. We have put nothing in our basement except oils. I certainly would not put any paint in a basement, and then have to bring it up again.

Mr. Nelson: Where one is cramped for room, a basement is a desirable thing.

J. G. Stuart (C. B. & Q.): We have just finished quite an elaborate paint and oil house, and we have put our barrel paints in the basement. If we were to build another one tomorrow we would do the same thing. When you come to barrel lots of paint, especially those that might come in wooden barrels, you cannot get a better place for them than the basement, where you can keep them cool, and where it is a great deal easier to keep them moist and, therefore, prevent sprinkling and leaking.

The supply officer should be considered when a building for him is going to be built. He should tell what he wants, how he wants it, and sizes and, in fact, all about it. The man who is going to use the building should be the man to tell how he wants it built.

About the windows: We finished a large storehouse a short time ago and we didn't put transom windows in. We used factory type windows. There is nothing as cheap as daylight and we want all we can get.

Another thought about the width of the storehouse. I believe about 80 ft. was recommended. We should not be too exacting about prescribing the width because the location and size has a good deal to do with the building. Our storehouse is 104 ft. wide on the outside. We have no lack of light. Operations are satisfactorily. By having two aisles instead of one, we get a great deal more storage space, and it is just as easy to haul the material from the outside toward the middle of the building as lengthwise.

H. C. Stevens (Wabash): Mr. Stuart, I fear, has misread the report. In the first place I don't think it is their intention to suggest that the engineering department should originate and prepare all the detailed data for these storehouses. As to the windows, they specifically recommend that the most satisfactory arrangement is the factory type window.

J. C. Kirk (C. R. I. & P.): If we dispense with wooden barrels, it won't make so much difference whether we have basement storage or car-floor storage in a shed. For a good many years we have been getting all paint and oil in one kind of shipping containers. They are made of steel, and even if it is necessary to store paints and oil out of doors, there is no evaporation or leaking. As far as our road is concerned we do not want basement storage.

Mr. Davidson asked for information about the use of air in handling oil. For 15 years at our general storehouse we had an air-pressure arrangement. There were several disadvantages. In the first place there is a certain amount of moisture in the air and it gets into the oil. In the second place, the man that operates it has to shut it off. Sometimes he can't tell just when the barrel is full and the result is the oil gets on the floor, and sometimes on the walls. About five years ago we installed an electric measuring system, with which you can gage the number of gallons, and it works entirely automatically. It is much superior to the air system.

Mr. Nelson: Mr. Davidson brought out a little while ago what he thought was rather undiplomatic wording of the general remarks. I agree with him. I suggest the paragraph read: "The location of store department buildings in connection with new general terminal layout be designated by the chief supply officer, etc."

The Chairman: The committee agrees to that.

Mr. Nelson: Our engineer has put in considerable time and thought in working out an air system that has so far proved entirely satisfactory and keeps the water and moisture from getting into the oil.

A. L. Sorensen (Erie): The last paragraph on the lumber sheds provides for placing the lumber on a wooden floor. If we are to use the wooden floor, should it not be of treated lumber?

After a few other suggestions, which the committee accepted, the report was adopted and the committee dismissed.

Inspecting Railway Material Not Under Specifications

By J. C. Kavanagh
General Storekeeper, Chesapeake & Ohio, Huntington, W. Va.

J. C. Kavanagh
Chesapeake & Ohio

Anything that contributes toward toward competitive buying is beneficial to the purchaser. When a commodity is such that it can be definitely described, a material specification to cover it serves as a medium for competition. There are, however, numerous items of railroad stocks which cannot be so defined. Typical examples of these are: air brake parts, repair parts for injectors, lubricators, pop valves stokers and other locomotive accessories. The requisites for such items are good materials and accurate machining, and there is no reason why the original or the parent source of supply should be the only acceptable one.

Experience shows there is nothing that we do, no matter how difficult we consider it, that someone else can't do just as satisfactorily. As long as we are doing it ourselves, we are inclined to think that this is not so, but when necessity demands a change, our work is carried on just as successfully by someone else. This same thing applies to materials.

Any reputable manufacturing concern, given suitable machinery and qualified men, can manufacture as good a product as any other manufacturer. Frequently, however, the work is not comparable with that of the original or parent manufacturer. There is only one way to insure the receipt of quality material, on all items coming within this category, and that is by inspection, the inspection to consist of a detailed comparison with a satisfactory product. Even without a material specification, this inspection may embrace analytical tests of the raw material, and a general visual comparison of the product in question, with that of an acceptable one, and a detailed check of measurements.

For the most part, the production of the article mentioned before has been confined to the original manufacturer but they cover a field in which a substantial saving can be, and, undoubtedly will be, made by all railroads as manufacturing competition develops.

The Prevention of Loss and Damage to Freight

Supply officers recognized as large shippers———Interest enlisted to reduce annual losses

By Joseph Marshall
Special Representative, Freight Claim Division, American Railway Association

Joseph Marshall

Loss and damage covers railroading like a blanket. There is hardly an activity of railroading which escapes its touch. The loss and damage bill is a measure of railroad efficiency and the combined constructive thought of every man in the service is required to keep it under control.

There was an increase of $525,747 in the bill of the railroads for 1927. This amounts to 1.4 per cent, which about balances the decrease of 1.5 per cent registered in 1926, and which marked the last year of a period of six, during which the general trend of loss and damage was downward. Since 1921 railroad ton miles have increased 134,000,000,000 while loss and damage has decreased almost 60,000,000; so that the upward fluctuation of $500,000 last year is not serious.

Ten or fifteen years ago the big problem for the railroads was that of lost freight. That problem, considering the volume of traffic, is now almost eliminated, the loss being about 88 per cent under that of 1921. Damage is the outstanding problem at present, although it is 30 per cent under that of 1921. The bill for damage alone totals over $18,000,000 per year.

Practically all the damage is recorded against freight moving in car lots. It is not known what goes on inside these cars because they are not opened until they reach destination. For this reason, the problem is not a simple one. It requires an entirely new plan of attack in which the shipper must play an important part because the method of preparing and loading the freight must be adequate to withstand the tremendous forces which are exerted in 100 car freight trains even under the most careful handling.

The largest amount paid per car loaded was for damage to fresh fruits and vegetables, which amounted to $8.54 per car. Eggs came next with a cost of $7.89, then household goods with $6.49, sewer pipe and tile with $5.50 and new furniture, $5.27, while other commodities trailed along with amounts ranging between $2.00 and $1.00 per car, then abruptly dropping to cotton and coal which cost 17 cents per car.

Supply Forces Can Help

The purchase and stores departments can help in this work. They have technical knowledge of value in some phases of the work. A representative sitting in a prevention meeting will find the discussion suggesting many points of contact.

On one road at least, the reclamation shops repair all damage freight, much of it furniture. It keeps the money at home, costs less and often, the consignee never knows of the damage.

One rule which, when not followed, is troublesome from a prevention standpoint, is that of providing junction stamps, transfer stamps and yard stamps for waybills. They must be of a certain size to fit the limitation of the waybill. These standards are often overlooked when ordering new stamps, resulting in the crowding of notations on waybills. The purchasing and stores officers may be able to help their roads keep to these standards when new stamps are ordered.

In the rough handling prevention campaign much complaint is heard from yardmen about their lanterns smoking and going out. The cause might be the oil. It might be the way the men care for the lantern. But the trouble will never be known until someone in position to do so looks into the problem.

Stop Oil Leakage in Cars

Greasy and oily car floors, caused by leaky containers is a problem. Perhaps the store departments produce some of this. At any rate, the problem is to have less of it, second, to find a way to prevent oil and grease penetrating the floor, and third, to find a way to remove the oil and grease after it penetrates the floor. There are a number of remedies but no cures. The transportation division attacked the problem in circular D. 11-246. It is a serious condition, creating damage, annoyance, and destruction of the useful value of the car.

Not long ago, a new box car was found in which the bolts on the inside projected out from the surfaces. It was found that the specifications did not call for countersinking it in this case, nor even the cutting off protruding ends of the bolts. Damage to freight results from exposed bolts.

Recently at a large transfer platform a fleet of new four-wheel trucks were installed. The floors of these trucks were secured by a binder rail which was screwed to the floor. Some of the screw heads protruded, as a result, these trucks could create enough damage to sacked and other goods to overcome the profit expected to accrue from their use. Floors of such trucks should be bolted and the bolts countersunk.

The aggregate of the claim account is caused by little things. As an example, many car door hasps have a slot punched in the end to enable the sealer to run the seal through both the slot in the end of the pin and the slot in the hasp, and do it in one operation. With this arrangement the sealer does not have to wrap the seal around the pin. These hasps are often replaced with a hasp which has no slot. The exercise of care to see that these slots are provided will help the prevention man.

The discovery, a simple sure method of temporarily stopping leaks in tank cars will save much money and trouble. This is also true of a car door that will open under all conditions with-

out the use of a pinch bar, a nail that won't work loose in the floor or siding of a box car, a steel car that won't sweat on the inside. The mechanical division have a committee working on the latter.

Study Loading and Packing

Possibly the purchase and stores division can help in loading. It is not at all certain that loading methods have kept pace with the growth in tractive power, in train loading and in car loading.

On most railroads the purchase and stores department is one of the largest if not the largest single receiver and shipper of miscellaneous freight. As such it can give the prevention man valuable help in the work he is trying to do to secure a load that will ride safely with reasonably good handling by both railroad and shipper.

Report on Office Methods and Office Organization

Favor use of standard invoice———Educational work stressed———Index of prices developed

James Deery
Chairman

It is recommended where there is no system of having the initial office prepare the combined requisition-inquiry-order form, the fanfold typewriter be used for writing orders and delivery forms, provided such offices average 100 or more orders per day.

Attention is called to the 1927 report of the committee that every effort be made to extend the use of the simplified invoice, and it is recommended that its use be given consideration by the Railway Accounting Officers Association for Accounts Receivable between carriers.

The committee suggests that the practice of numbering invoices be discontinued. Five million invoices are rendered against the railroad companies annually, and unless they are filed by number in consecutive order, the numbering is unnecessary.

The committee is convinced of the desirability of educating and developing employees in the purchasing department to fit them for promotion to higher positions and recommends that employees be given every opportunity to learn the work attached to the position ahead. To aid in this endeavor it is suggested that a narrative of the work in each position be prepared and made available to the employees. It is further recommended that employees visit the company shops where they can see the material applied and learn its use and that, as far as possible, they be permitted to visit the mills and factories where they can secure a more intimate knowledge of its composition and character.

Price Index of Commodities

A study of the price trends of 115 items representing approximately 75 per cent. of the material used by railroads was made and a comparison of their unweighted index relation for the 115 items to the prevailing price in 1926 was made with the following results:

The 115 items on February 29th showed the index	95
The Department of Labor for all commodities reported the February index as	96
Dun, for February reported the index as	103
Bradstreet reported the February index as	103

The study has not progressed sufficiently to reconcile the difference between the railroad index and those included in the comparison. However, a railroad index can be adopted and changes can be recorded weekly at small expense. The index gives an intimate knowledge of each item considered and not only helps to visualize the relation of any item to other items of kindred use, but immediately suggests the question of the price relation of the commodity to those of its raw materials. For example: If the index for box car paste is 89, and if the linseed, the oil raw material, is 75, the discrepancy invites investigation. It is recommended that the subject of price trends for railroad commodities be studied further.

The report is signed by Jas. Deery (chairman), asst. purchasing agent, Penn.; W. W. Griswold, purchasing agent, W. & L. E.; Wm. Hartman, office manager, purchasing department, M. P.; C. C. Hubbell, purchasing agent, D. L. & W.; E. S. Jamieson, chief clerk to purchasing agent, U. P.; C. H. Kenzel, purchasing agent, E. J. & E.; P. C. Mayer, office manager, purchasing department, I. C.; B. B. Melgaard, asst. purchasing agent, C. M. St. P. & P.; C. S. White, purchasing agent, N. Y. C.; A. N. Laret, asst. to chief purchasing officer, St. L. & S. F.; C. D. Baldwin, purchasing agent, Bang. & Aroo.; H. L. Taylor, asst. purchasing agent, C. N.; R. L. Tindal, purchasing agent, N. Y. C. & St. L.; O. L. Browne, asst. purchasing agent, A. C. L.; C. E. Walsh (chairman ex-officio), purchasing agent, Penn.

Discussion

Mr. Gerber: What is the reason for the recommendation that invoices should not be numbered? We file them by numbers. If any question comes up on the receipt of material the invoice and order number are always presented in the correspondence. If you provide numbers up to 1,000,000 and start again on another number, you can almost determine by the number of the invoice the month or period on which that invoice was rendered. That is a help.

H. H. Laughton (Southern): I'd like to know what sort of record is kept in the purchasing agent's office on the order number when they receive an invoice. On the carbon of the order which is filed in the purchasing agent's office we place the invoice number when the material has been received and billed for. We put the number of the invoice opposite the item of material as covered by the order.

Mr. Deery: You would want to put the date of the bill on the order, wouldn't you?

Mr. Laughton: No.

Mr. Deery: How do you check and find that an order is shipped?

Mr. Laughton: By the open items against which you have no invoice number.

Mr. Deery: You have to look at the bill to find out the date the shipment was made.

Mr. Laughton: We don't care for that, because then the bill is filed or vouchered.

J. P. Cavanaugh (C. & O.): It is a bad move to take the number off the invoice. You have practically the same work to do whether you number or not. The only additional work necessary is to put the number on. It takes a second.

L. F. Duvall (A. C. L.): My experience has taught me the best way to index is to cross-index, one by number and one alphabetically.

N. B. Coggins (Southern): The elimination of the numbering of invoices may be all right so far as the purchasing agent is concerned, but on the division storekeeper's record, we ought to have a number on an invoice.

C. E. Walsh (Penna.): The committee is not recommending discontinuing numbering of invoices. It is calling attention to the 1925 report, which did that. On the Pennsylvania we number invoices. The purchasing and stores department do not think it is a good thing, but we were over-ruled by the accounting department. We do not think numbering of invoices is absolutely necessary.

A motion previously made to amend the report to eliminate the recommendation against numbering of invoices was put to a vote and lost, whereupon the report was accepted without further discussion

Supply Officers Discuss Forest Products

Standards, prices, penalty clauses and conservation feature remarks on committee report

[The report of the Committee on Forest Products, of which the following is the discussion, will be found on page 103 of the June 21 Daily Edition of the *Railway Age*.—EDITOR.]

John Foley (Penna.), committee chairman: There has not been much discussion of lumber standardization in Division VI. There has been considerable discussion outside, forming what is known as the Battle of the Thirty-second of an Inch. Other phases of the subject have been obscured. A great many things have been established and fixed in the lumber industry that had very little to do with the 1/32 in. A great many sizes have been reduced. There has been a reduction in the grades which is a vast credit to those in the lumber industry who have worked on the problem.

The adoption by Divisions IV and VI of American lumber standards has made it important for you to take the action which has been recommended, that is, to make use of them. That, unfortunately, has not been done to the extent desirable. Confusion has existed in the minds of many because the thickness of 1-in. lumber used in car construction has been argued back and forth, as to whether it should be 25/32 in. or 26/32 in. That matter has been settled by the Mechanical Division through their adoption of 26/32 in. Its construction committee reported as follows: "Your committee feels that before any action is taken in connection with the purchase of lumber, under American lumber standards, the new sections which are illustrated in this report be issued as permissible alternates to the present A. R. A. standard lumber sections for a period of one year, during which time railroads should obtain prices on the proposed lumber sections, as well as for the present standard sections, so that at the end of the year they will know whether or not enough money is saved by using the proposed sections to justify the change from existing standards. During the year the proposed standards should be permissible for maintenance and new cars. In all cases the moisture content specification should be followed."

It is very important that the members of Division VI proceed to get comparative prices on the former M. C. B. standard section and on the permissible alternate sections of 1928. It is absolutely essential that you stipulate the moisture contents that the Mechanical Division adopted for car lumber in 1926. They are 10 per cent, 12 per cent, and 20 per cent. It will not do to get prices on the new lumber standards and compare them with the old because there were no moisture restrictions in the old M. C. B. patterns.

The new sections of the Mechanical Division are based on the best practice in lumber manufacture. They provide for the patterns which are to be used for yard lumber. The tongues are slightly different in form. The provisions for fitting the tongues in grooves are in accordance with those of the lumber industry so there should be a saving since car lumber is no longer a special pattern, but comparisons will not be of any value unless you provide for the same moisture contents in both the old and new patterns.

The fact that railroad buyers of forest products find some sellers of wood unfamiliar or unsympathetic with American lumber standards, is no reason why the actions of Divisions IV, V and VI should not be made effective through purchasing the American lumber standard grades and sizes as far as possible. The benefits of standardization will not be obtained until these standards are insisted upon wherever the lumber can be used. It will save money if we can confine our purchases to standard material.

There is a section in the present A. R. A. publication of American lumber standards which provides that five per cent of a shipment may be under-graded. That has been construed by some shippers to permit the shipment of a percentage much larger than five per cent in certain items of a shipment, provided the per cent of the whole shipment did not exceed five. In order to prevent any such abuse, the section has been amended by substituting for the words "a shipment" the words "each item in a carload or a cargo."

E. W. Peterson (Bangor & Arovstook): Has the committee any suggestion or information as to a penalty clause for failure to make delivery at the time specified on the purchase order? We had a case come up and were considerably embarrassed on account of non-delivery of material.

A. W. Munster (B. & M.): Sometimes that situation may arise where the purchasing agent wants to buy too cheaply. If you know your markets and know the dealers, that situation does not arise.

O. Nelson (U. P.): It is not feasible for this division to consider a subject of that kind. If we did, there would be a boost in the lumber price.

Mr. Foley: I would like to ask Mr. Peterson if he applies that principle to any other material besides forest products?

Mr. Peterson: No. Other material is more easily obtainable than forest products.

Mr. Foley: Since you do not apply it in other material, why should it be applied to forest products?

Mr. Peterson: When a purchase order is placed with a lumber dealer who agrees to accept the date, and he fails to meet that date, considerable inconvenience is caused the storekeeper on account of plans previously made.

Mr. Satchell (N. Y. O. & W.): We made a contract with a lumber firm that failed to deliver. We went to the open market, bought the lumber at a higher price and collected the difference from the dealer with whom we had the contract.

D. C. Curtis (C. M. St. P. & P.): Did the committee consider the registering hammers of the different railroads for marking ties?

Mr. Foley: The committee did not. Division IV has this year assigned its tie committee the subject, "How should forest products be branded, and what types of hammers should be used?" Out of that work there undoubtedly will be compiled a collection of the various hammers now in existence with recommendations.

Mr. Curtis: There is confusion between the railroads and producers. It is causing wrong distribution of ties. The hammers should be registered.

A. L. Sorensen (Erie): On lumber f.o.b mill, versus f.o.b destination, are the weights those indicated in tariffs?

Mr. Foley: They are lumber association weights and not those in the tariffs.

Mr. Sorensen: Are they agreed to by the railroads?

Mr. Foley: In most instances they are.

Mr. Sorensen: Will the recommendation on moisture content take care of part of the variation between the weight f.o.b. mill and f.o.b. destination?

Mr. Foley: It will have a decided effect on reducing the wide variation.

Mr. Sorensen: Do the railroads have any say in

determining the weights included in the association reports?

Mr. Foley: No.

J. G. Stuart (C. B. & Q.): Lumber is constantly getting scarcer, and we have been told several times that we should conserve in every way possible. The committee's recommendation on using short lumber is good. On our road we have had a custom of sending out lumber for the use of bridge and building gangs in making things. In the past two years we have been going into the manufacture of lumber. In several of our lumber yards we have machine shops operated by the store department and we are gradually making a great many items so that we can ship them out ready for use, such as stock-yard shoots, stock-yard gates, ice boxes for engineers, and concrete forms for various jobs that are to be put in. We can do the work a great deal cheaper because we have machinery.

We also find that instead of sending out lumber in 60 ft. lengths, which is also fairly common, we can use up all the short pieces. We are using lots of pieces two feet long. We have very little waste in the lumber yard now compared to what we had on the line. Recently we sent out concrete forms for a large track scale. To a very great extent we made them with 35-cent labor and practically every bit of the sawing was done on machines. A great deal of fitting was done on machines. You can do it for just about one-half of what it will cost in the field and do just as good if not a better job.

E. H. Polk (S. P.): On the Southern Pacific the stores department has had charge of the lumber, doing all the work Mr. Stuart describes and even frame building and bridge lumber. The short ends are used and this includes the use of second hand lumber. Hundreds of thousands of board feet of old lumber has been so used.

It was moved and seconded that the report be accepted.

Standardization and Simplification of Stocks

Needless variation in sizes of material disclosed by survey——— Simpler lists prepared

L. V. Hyatt
Chairman

It is realized that generally all railroads recognize the results to be accomplished by a constant and careful scrutiny of stocks on hand, with the object of eliminating slow moving and unnecessary sizes and various kinds, but there is yet much that can and should be done in this respect.

In connection with the standard lists of material made in 1926 and 1927 the committee canvassed thirty railroads with a questionnaire, asking:

1. Has your road adopted these lists as a stock book standard?

2. If not, have you, to any extent, modified or simplified your standard stock-book list of sizes to agree with the list recommended by Division VI?

The replies received and the comments made are too varied to summarize, but seven or eight roads reported the adoption of the lists in their entirety with possible exception of altering certain gages to conform to their specifications. Another group of roads have gone further in the simplification of sizes without increasing the number of items. Many roads are constantly working on simplification and elimination, using the recommended lists as a guide.

Babbitt and Solder

The canvass of roads indicates that the majority of the railroads limit the grades of babbitt to three and solder to two:

One grade babbitt (approx. 75 per cent. tin) for lining crossheads, driving boxes, etc.

One grade babbitt (approx. 85 per cent. lead) for lining bearings.

One grade babbitt (approx. 80 per cent. tin and 3 per cent. copper) for high-speed motor bearings.

One grade solder (50 per cent. lead and 50 per cent. tin) for locomotive shops and tinning.

One grade solder (55 per cent. lead—45 per cent. tin) for general tin shop work.

Flexible Staybolt

As a means of reducing the number of sizes of flexible staybolts carried, the committee recommends one-inch gradations of length in the most generally used sizes and the listing of lengths in two-inch gradations for the longer lengths. Most roads confine diameters to 1 in., 1-1/16 in., 1-1/8 in., 1-3/16 in. and 1-1/4 in.

Steel Tubing

Same of the largest roads are limiting the requirements of steel tubing to 10 sizes, others carry between 13 and 25 sizes and other roads carry as high as 95.

In one of the larger railroad centers where a steel tubing company carries a warehouse stock for the protection of five Class 1 railroads, it was found that while none of the five roads listed over 25 or 30 sizes, the company is compelled to carry or provide a variety of over 100 sizes. It is recommended that the railroads select the minimum number of sizes out of the 70 sizes in the following list.

1⅛"x ¾"	2¼"x1½"	2⅜"x1⅞"	3⅛"x2⅜"
1½"x1 "	2¼"x1⅝"	2½"x2 "	3½"x2½"
1⅝"x1 "	2¼"x1¾"	2⅝"x2¼"	3½"x2½"
1⅝"x1⅛"	2¼"x1⅞"	2⅝"x1⅜"	3½"x2¾"
1⅜"x1 "	2⅜"x1⅜"	2⅝"x2⅜"	3½"x3 "
1¾"x1¼"	2⅜"x1¾"	2⅞"x2¼"	3¾"x2¾"
1⅞"x1⅜"	2⅜"x1⅞"	3 "x1¾"	3¾"x3 "
1⅞"x1½"	2½"x1⅛"	3 "x2 "	3¾"x3½"
2 "x ¾"	2½"x1¼"	3 "x2½"	3⅞"x2⅞"
2 "x1 "	2½"x1⅜"	3 "x2⅜"	4 "x2¾"
2 "x1⅛"	2½"x1½"	3 "x2½"	4 "x3 "
2 "x1¼"	2½"x1¾"	3 "x2⅝"	4 "x3¼"
2 "x1⅜"	2½"x1⅞"	3⅛"x2 "	4 "x3½"
2 "x1½"	2½"x2 "	3⅛"x2¼"	4¼"x2¾"
2⅛"x1¾"	2¾"x1¾"	3⅛"x2½"	4¼"x3½"
2⅛"x1⅞"	2¾"x2 "	3⅛"x2¾"	4½"x3½"
2¼"x1¼"	2¾"x1½"	3¼"x3 "	5 "x4 "
2¼"x1⅜"	2¾"x1¾"		

It is also recommended that, for the sake of uniformity and to conform with general past practices, steel tubing be listed by giving the outside dimensions first, followed by the inside dimensions. Although the manufacturers' standard practice is to list the outside diameter first, then the wall thickness mental computations are saved if the outside diameter and inside diameter are given.

Bar Iron and Steel

The committee, after checking over the stock lists of 15 or 19 roads, and finding that the number of sizes carried ranges from 41 to 205, submits the following sizes, consisting of 24 rounds, 11 squares, 4 half rounds and 89 flat bars, bands and plates, as a model list. With the possible substitution of a few sizes in the flats, any railroad will find this list fully covering all requirements.

Round	Round	Round	Square	Half Round
¼"	1"	2"	½"	¾"
5/16"	1⅛"	2¼"	¾"	1"
⅜"	1¼"	2½"	⅞"	1½"
7/16"	1⅜"	2¾"	1"	1½"
½"	1½"	3"	1¼"	
9/16"	1⅝"	3¼"	1½"	
⅝"	1¾"	3½"	1¾"	
11/16"	1⅞"	4"	2"	
¾"			2¼"	
13/16"			2½"	
⅞"				

Flats

⅛"x½"	3/16"x2½"	⅜"x5"	1⅛"x4"
x1"	x3"	x6"	x5"
x1¼"	x3½"	¼"x1½"	1¼"x3"
x1½"	x4"	x2"	x3½"
x2"	x5"	x2½"	x4"
x2½"	x6"	x3"	x4½"
x3"	x7"	x3½"	x5"
	x8"	x4"	x6"
5/16"x½"	5/16"x1"	x5"	x8"
x2"	x1¼"	x6"	x12"
x4"	x1½"	x8"	1⅜"x4"
x5"	x2"	x10"	x4½"

¼"x¾"
x1"
x1¼"
x1½"
x2"
x2½"
x3"
x4"
x5"
x6"
⅜"x¾"
x1"
x1¼"
x1½"
x2"
x2¼"
x3"
x3½"
x4"
x4½"
x5"
x6"
x7"
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⅝"x1½"
x2"
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x3½"
x4"
x4½"
x12"
⅜"x2"
x2½"
x3"
1"x2"
x2½"
x3"
x3½"
x4"
x4½"
x5"
x6"
x8"
x10"
x12"
1⅛"x2"
x3"
x4"
x4½"
x5"
x6"
x8"
x12"
2"x4"
x5"
x6"
x8"
x12"

Sheet Iron

From data gathered by canvassing many roads, the committee finds that considerable simplification can be done in the sizes of light sheet steel and iron. Carrying of one gage metal in four to ten and sometimes more sizes is unnecessary. All ordinary requirements can be economically met by standardizing on sizes similar to those listed. They are included in the Department of Commerce recommended sizes and the descriptions used are manufacturers' standards.

Galvanized Steel Sheets		One Pass—Cold Rolled Box Annealed Sheets	
No. 16	USS. Ga. 30" or 36"x96"		
No. 18	" " " " " " "	No. 18	USS. Ga. 30"x96" (or 48"x120")
No. 20	" " " " " " "	No. 20	" " " " " " "
No. 22	" " " " " " "	No. 22	" " " " " " "
No. 24	" " " " " " "	No. 24	" " " " " " "
No. 26	" " " " " " "	No. 26	" " " " " " "

Jacket Steel

Only one size sheet is recommended as follows:
No. 18 or 20 or 22 USS. Ga. 30 in. by 96 in.

Blue Annealed Steel Sheets

No. 8—48"x120"
60"x120"
72"x144"
No. 10—48"x120"
60"x120"
72"x144"
No. 12—48" x 120"
54" or 60"x120"
No. 14—48" x 120"
54" or 60"x120"
No. 16—48" x 120"

NOTE: All thicknesses greater than No. 8 are classified as plates, No. 8 and below No. 8 as sheets.

Stack Netting

Where woven front-end stack netting is used, the average railroad need only carry one gage, mesh and width. Where patent or perforated metal is used, the committee cannot consistently recommend sizes.

Air Brake Material

Thirty railroads were asked how many items of air brake material were listed in their stock books and what percentage of these items were active. The results of this canvass are tabulated below.

Road	Items Carried	Items Active	Road	Items Carried	Items Active
A	1700	1500	P	1215	90%
B	1176	all	O	467	all
C	1300	....	R	1645	....
D	1011	354	S	1374	75%
E	758	495	T	1508	990
F	755	679	U	1596	all
G	1120	all	V	2400	....
H	1288	845	W	2205	325
I	1122	all	X	2170	857
J	1178	715	Y	1122	....
K	1440	785	Z	854	813
L	1899	1750	AA	906	741
M	1615	1596	BB	856	583
N	1542	742	CC	5200	70%
O	1320	1075	DD	1140	95%

The following groups of material are based on the canvass of representative roads. It is the committee's opinion that the range of sizes will meet all average requirements.

Cotton Duck		Wire Brads		Hose Clamps Except Tank Hose	
No. 4	84" wide	½"	No. 20	½"	3 ply
No. 6 or 8	36" "	⅝"	No. 19	½"	4 "
	60" "	¾"	No. 18	⅝"	5 "
	84" "	⅞"	No. 18	¾"	4 "
No. 10 or 12	36" "	1 "	No. 17	1 "	4 "
	48" "	1¼"	No. 16	1¼"	4 "
	60" "	1½"	No. 16	1½"	4 "
	72" or 84"	1¾"	No. 14	2 "	4 "
	96" "	2 "	No. 14	2½"	4 "
				3 "	4 "

Stove Bolts

Flat Head		Round Head	
5/16"x ½"	¼"x1½"	¼"x1 "	1 "x1¼"
x ¾"	x2 "	5/16"x ½"	x1½"
x1 "	x2½"	x ¾"	x2 "
x1¼"	x3 "	x1 "	x2½"
x1½"	5/16x1 "	x1¼"	x3 "
x2 "	x1½"	x1½"	5/16"x1 "
¼"x ½"	x2 "	x1¾"	x1½"
x ¾"	⅜"x1½"	x2 "	x2 "
x1 "	x2 "	x2½"	⅜"x1½"
x1¼"	x3 "	¼"x ½"	x2 "
		x ¾"	x2½"
		x1 "	x3 "

Cotter Keys

" 5/8"	⅜"x3 "	¼"x2 "	½"x6 "
" 2 1/8"	x4 "	x3 "	⅝"x3 "
" 5/8"	x5 "	x4 "	x4 "
" 2 5/8"	½"x3 "	5/16"x3 "	¾"x4 "
" 5/16 1 3/8"	x4 "	x4 "	
" 5/16 1 1/4"	x5 "		

NOTE: One of the largest roads has used a standard list with 4 less sizes, since 1921.

Tool Handles

36" Axe
36" Clay pick
36" Spike maul
14" Claw hammer
16" or 18" machinist
14" Hatchet
22" Sledge or hammer
26" " " "
30" " " "
36" Tool or punch

Standard Files

Flat bastard	4"	6"	8"	10"	12"	14"	16"	18"
Flat smooth	4	6	8	10	12	14	16	..
Mill bastard	4	6	8	10	12	14	16	..
Half round bastard	4	6	8	10	12	14	16	..
Half round smooth	4	6	8	10	12	14	16	..
Round bastard	4	6	8	10	12	14	16	18
Square bastard	4	6	8	10	12	14	16	18
Round smooth	.	6	8	10	12	14	16	..
Wood rasp	.	.	.	..	..	14 or 16	..	..
Knife bastard	.	4	6	8	10	12	..	..
Slim taper saw	3"	4	6	8	10	..	..	..
Ex. slim taper saw	.	.	6	.	..	..	..	..
Cross cut saw	.	.	.	8 or 10	..	..	..	..
Hand saw files	.	.	6	8	10	..	..	..

Index of Standards

The following index is given of various materials on which the U. S. Department of Commerce or Division VI, A. R. A. have adopted standards.

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Surplus and Inactive Stock

Surplus material should be accumulated at a central point on the railroad wherever the extent or geographic arrangement is favorable or where the material is of such a general nature as to lend itself to substitution. Where the foregoing procedure is not practical, surplus material should be reported to the general storekeeper who should maintain a record either in the master stock book or on forms provided for the purpose and all requisitions for similar material should be checked against this record or against the store where the surplus may have been concentrated, and material substituted for that ordered wherever practical. Where material cannot be liquidated in this way the study of its disposition should be definitely assigned to a supply department officer, who should make his study in coordination with the using departments; or it should be assigned to a committee of using and supply department representatives.

Information developed by the committee indicates there is not yet a disposition on the part of the railroad to purchase material from other roads. For this reason it is believed that an exchange agency would not, at this time, be able to accomplish the desired results. However, results might be obtained by railroads in certain districts or zones mutually agreeing to buy, sell or exchange surplus material among themselves, under certain restrictions as to what classes of material the agreement shall apply, condition of material offreed for sale, etc. The committee recommends that the Purchases and Stores Division take the initiative by requesting the railroads in certain zones to appoint representatives on a committee that shall meet to discuss the possibilities in such an arrangement, and come to an agreement as to exchange of surplus material between themselves under whatever restrictions may seem advisable.

In conclusion it is emphasized that the adherence to standard sizes and kinds of material and to nationally recognized standards and specification is important to the solution of the problem of avoiding surplus and inactive stock as well as to facilitate its liquidation wherever it may unavoidably occur.

The report is signed by L. V. Hyatt (chairman), supervisor of standardization, M. P.; E. J. Leonard, division storekeeper, C. & N. W.; H. A. Paar, asst. general storekeeper, M. C.; G. W. Leigh, asst. purchasing agent and general storekeeper, Soo; E. S. Marsh, general storekeeper, W. & L. E.; F. C. Warren, general storekeeper, St. L. & S. W.; L. F. Duvall, asst. general storekeeper, A. C. L.; A. L. Hayden, traveling storekeeper, S. P.-T. L.; A. G. Follette, asst. chief material supervisor, Penn.; V. N. Dawson, asst. general storekeeper, B. & O.; S. Sneddon, district storekeeper, C. N.; A. W. Munster, purchasing agent, B. & M.; E. Harty, asst. general storekeeper, S. P.; C. D. Young (chairman ex-officio), general purchasing agent, Penn.

Discussion

E. W. Peterson (Bangor & Aroostook): I should like to emphasize the importance of that recommendation, including the sentence "that whenever a decision is reached, it should be included in the instructions covering the adoption and application of the new standard, and in that way dispose of the material that would otherwise be left on hand."

D. B. Allan (U. P.): The report contains the statement that the committee has data indicating that the average railroad need only carry one gauge, mesh and width of stack netting. What gauge and what mesh is recommended?

Mr. Hyatt: We recommend no specific gauge, but only that there should be just one gauge, No. 9 or No. 10. Any railroad can get along with one gauge. The same applies to the width; whatever width that particular road finds most advantageous should be used, and no other. We don't refer to patented netting, or screen.

The report was accepted as read, without further discussion.

The Manufacture of Concrete Products on Railroads

Culvert pipe, piling and bridge slabs in output of stores operated plants on Burlington

By I. G. Morrison

Storekeeper, Chicago, Burlington & Quincy, Havelock, Nebr.

I. G. Morrison
Chairman

During recent years the increase in the use of concrete products for railroad purposes has developed rapidly. Where wood was used almost exclusively in the construction of bridges, culverts and miscellaneous items a few years ago, concrete is now used, especially on railroads which do not extend into the timber territories. Furthermore, concrete is a more permanent construction and not subject to fire.

Because of the increase in use, some railroads centralize the manufacture of the various products instead of manufacturing them in the field. By centralizing, permanent plants can be established and, the work can be done cheaper.

For several years the Chicago, Burlington & Quincy has centralized the manufacture of concrete products at Montgomery, Ill., at the Tie Treating Plant near Galesburg, Ill., and at Havelock, Nebr.

Eighteen Varieties

The principle products manufactured at these plants consists of

Culvert pipe 18 in. to 72 in., in diam.
Moulded piling from 12 to 40 ft. in length for bridges.
Bridge slabs: 7 ft. by 14 ft., 16 ft. and 20 ft.
Bridge deck slabs: 5 ft. by 14 ft.
Building blocks.
Lumber foundation blocks.
Water troughs and stands for stock yards.
Side walk slabs for bridges.
Fence posts.
Fence post anchors.
Corner and gate posts.
Corner and gate post braces.
Station curbing.
Bulkheading for bridges.
Foundations for railroad crossings.
Planks for highway crossings.
Mile posts.
Whistle posts.

At the Montgomery and Galesburg plants, pit gravel is used because gravel pits are close to these points. The Havelock

plant uses a sand-gravel mixture procured from the Platte river about 30 miles distance. Several cement plants are located on this railroad which provide a short haul for cement.

During the past 10 years additional facilities have been installed at these plants until at present permanent equipment and machinery are available. Permanent forms and concrete platforms on which to work, electrically operated concrete mixers, mixer cars, clamshell buckets, etc., have been provided to reduce the manufacturing cost.

Stores Operate Plants

The plants are all operated by the stores department. The engineering department furnish the blue prints covering the items required and specify the proportion of the ingredients to be used and the stores department make the forms, manufacture the products and furnish the completed material, ready for use.

Under this arrangement, the manufacture of these products is done on a piece work basis which is not possible in the field. The stores department, handling all of the material used by the railroad, also is in a position to recommend from time to time the substitution of concrete for other materials.

There are numerous cases where this has been done and concrete adopted as cheaper and more permanent. For example, the Burlington previously used 8 in. by 16 in., treated lumber for bulk heading for bridges it being necessary to treat the lumber to prevent decay. By experiments, it was found that concrete plank 4 in. thick would be satisfactory and could be manufactured for much less than the cost of purchasing and treating the lumber.

At present, wooden posts are being used for highway crossing signs but experiments are now being made to determine whether a concrete post, reinforced with scrap boiler tubes, will not be more satisfactory and cheaper.

It was formerly thought that concrete products could be manufactured only in the summer months, but by using hot water for mixing the cement, and steam for accelerating the curing it has been found profitable to operate during the entire year.

In locating a centralized plant, consideration should be given to the source of supply of the raw materials. Special attention should be given to the construction of the forms and platforms and provision made for electrically operated equipment to reduce the cost of manufacture to a minimum.

Plan of Supply Organization

H. C. Pearce
Chairman

The committee submits the following report of fundamentals to govern the organization of purchases and stores:

(1) There shall be a complete separation of the service of supply from the using departments, and the duties of each clearly and definitely defined.

(2) There shall be an organization sufficient and capable of determining the needs, providing, distributing, and controlling all materials and supplies until used or salvaged, purchase all articles required, including equipment, and negotiate the sale of all materials.

(3) The organization shall do all primary accounting subject to the direction and control of the accounting department. Employees performing this work shall be under the direct control and discipline of the service of supply.

(4) We recognize the fundamental necessity of a practical, workable material specification, clearly understood by manufacturers and drawn so that it can be properly interpreted by tests and checks, knowing that material cannot be purchased in fair and open competition without material specifications any more than it can be procured of suitable size and design without drawings showing the design and the measurements.

The report is signed by: H. C. Pearce (chairman), director of purchases and stores, C. & O.; R. C. Vaughan, vice-president, C. N.; H. H. Laughton, asst. to vice-president operation, Sou.; M. J. Wise, asst. to vice-chairman, S. P.; C. D. Young, general purchasing agent, Penn.; G. W. Bichlmeir, general purchasing agent, U. P.

Discussion

A minority report was made by M. J. Wise, of the committee, consisting of the following recommended substitution for Par. 4:

"We recognize the necessity for safeguarding the railroad's interest by insuring receipt of material coming up to specifications and that it is desirable to have an inspection and test organization for this purpose, the head of which should report directly to the executive officer in charge of the service of supply."

D. B. Allan (U. P.): Mr. Wise says in one breath that he wishes to safeguard the railroads' interests by insuring the proper inspection of materials and supplies. He states that this inspector or this chemist, or this engineer of tests, shall report directly to the executive officer in charge of the service of supply. The report is ambiguous in not stating just what officer he refers to. If he refers to a vice-president in charge of operations, or to a general manager in charge of operation who indirectly has jurisdiction over the service of supply, his point might be well taken. However, I take it to mean that he expects this man to report direct to the head of the supply section, in which event the recommendation is absurd.

W. F. Jones (N. Y. C.): The officer in charge of the tests and specifications, who will rule on all this material, should be connected in some way with the motive power or rolling stock departments or the engineering department. On the New York Central we have an independent organization that reports to the chief motive power officer. We get along and get good material, but don't keep the specification. The purchasing agent is notified and he buys materials that meet the specifications and tests.

Mr. Pearce: While not agreeing with Mr. Wise, I am happy to be able to say that he did not have any ulterior motive in his minority report. He desired to add to the functions already described that the engineer of tests should report directly to the chief purchasing officer.

G. E. Scott (M.-K.-T.): We are organized on that matter, and we have no difficulty whatever in securing the proper material, by having the test department in the purchasing department.

C. B. Tobey (L. V.): I believe this report has to do with the question as to whether the engineer of tests reports to the general storekeeper or not. On our railroad the engineer of tests reports to the general storekeeper. I think the general storekeeper should be held accountable not only for the quantity of material but also for the quality. By having the test department in the hands of a more or less disinterested department you are going to get better results for the using departments than if it came under one of the using departments.

U. K. Hall (U. P.): We are arguing one point only of this report and overlooking the fundamental principles brought forth. We have here four clear and distinct paragraphs, the basis of an organization which will take care of all the subjects that we have been discussing during the past twenty years.

Without further discussion the majority report was accepted as read and the committee dismissed.

Report on Reclamation and Scrap Handling

Importance of ascertaining true costs emphasized———
Co-operate with users on methods

The importance of reclamation and scrap handling as a means of effecting economy and savings for the railroads is being recognized more each year. This is indicated by the interest manifested by executive officers and has resulted in the establishment of many modern scrap handling and reclamation plants.

One of the reasons why scrap preparation and reclamation have not made greater progress is the use of figures which could not be substantiated; therefore the committee emphasizes the importance of obtaining accurate costs on all scrap handling and reclamation operations. Careful consideration should be given to the necessity for each operation and its economy as compared with market prices, etc. On some railroads the distance from markets governs the reclamation operations of many items to some extent.

At the 1927 meeting the standard scrap classification was revised to co-ordinate it with the so-called master classification advocated by the U. S. Department of Commerce, and the committee recommended the adoption of the revised classification by all railroads. In meetings this year the revised classification was given further consideration and it was decided that no changes be made for the present.

Scrap Yard on Missouri Pacific

Facilities for Handling Scrap

After visiting several modern scrap-handling plants, it is the opinion of the committee that gantry or overhead cranes should be used for handling scrap when the tonnage outbound is in excess of 2,500 net tons per month. Cranes of these types should fulfill approximately the following specifications:

80-ft. to 120-ft. span, bridge travel 350 ft. per min.
10-ton to 15-ton capacity cranes, trolley travel 175 ft. per min.
60-in. to 65-in. magnets, hoists travel 55 ft. to 80 ft. per min.
30-ft. to 35-ft. lift.

Tonnage under 2,500 net tons per month should be handled with locomotive cranes equipped with magnet.

It is recommended that the following equipment should also be used:

Alligator shears with 24-in. knives and a speed of 55 to 60 strokes per min. for cutting flues, tubes, pipe, etc.

Alligator shears with 30-in. knives and a speed of 25 to 30 strokes per min. for cutting boiler plate, car sides, and other material up to 4 in. in diameter.

Skull crackets for breaking castings.

Manifold system for supplying oxygen and cutting gases to the scrap plant.

Power hammers for breaking non-ferrous metals from ferrous scrap, and magnetic separators for removing ferrous metal from brass borings, turnings, etc.

The committee investigated the use of artificial and natural gas as a cutting agent and found that at present it is not as economical as other cutting gases, but with improved torches it believes that artificial and natural gas have possibilities and recommends that future committees give it study.

Uniformity in scrap handling costs is important and the committee has outlined a tentative method of figuring the costs of handling scrap which should provide a standard basis for all roads in determining these costs. It is separated between handling and preparation, due to the fact that some roads do not prepare the scrap to the highest classification, although the committee recommends that this be done.

Scrap Sorting	*Scrap Preparation*
Supervision.	Supervision.
Clerks.	Clerks.
Sorters.	Cutters (oxygen-acetylene).
Cranemen.	Shearmen and helpers.
Miscellaneous labor.	Cranemen.
Labor furnished by other departments.	Miscellaneous labor.
Power, electric, air, water, etc.	Labor furnished by other departments.
Heat.	Power, electricity, air, water, etc.
Light.	Heat.
Miscellaneous supplies.	Light.
Maintenance (scales, cranes, track, buildings, etc.).	Oxygen.
Switching.	Cutting gas.
	Miscellaneous supplies.
	Maintenance (shears, cutting equipment, buildings, etc.).

Sale of Scrap

For the purpose of providing uniformity in the sale of scrap by the railroads, the committee suggests the following procedure:

1. Sale of scrap to be made monthly unless local conditions do not warrant such an arrangement.
2. Offer of total tonnage for each classification regardless of location.
3. Sealed bids to be submitted specifying time and date bids must be in the office of the purchasing agent.
4. Awards to be forwarded to successful bidders within 48 hours after closing time and date.
5. Bids to be held and opened on the date specified in the presence of authorized representatives of the railroad purchasing agent.

It is recommended that locomotives be dismantled by stores department forces where railroads maintain a scrap-handling and reclamation plant.

Reclamation

Recent developments have demonstrated that crank case oil removed from gas-electric rail cars can be successfully reclaimed and re-used. The reclamation of signal material is practicable. Train control material has been in use but a comparatively short time, and parts which require replacing come under the category of repairs. However, supervisors at scrap plants should familiarize themselves with this material so that any parts that find their way into the scrap can be recovered and repaired.

The committee has carefully checked over the list of standard recommended practices adopted at the 1925 annual meeting, including several additions and changes, for the purpose of bringing the list up-to-date, to be printed and distributed in separate pamphlet form, which will be of great value to foremen and other employees at reclamation plants.

Scrap Yard on Delaware, Lackawanna and Western

As recommended in the 1927 report, the Mechanical Division, A. R. A., appointed a sub-committee to act jointly with a sub-committee of the reclamation committee for the purpose of reviewing reclamation problems of interest to both divisions and to determine the practicability of reclamation operations before adopting or rejecting them. This joint committee held two meetings during the year, and a tentative report has been sub-

mitted to the general committees of both divisions. It is expected the committee will be continued and it is felt considerable uniformity of recommended practices and economies will result.

The report is signed by A. L. Prentice, (chairman) supervisor of scrap and reclamation, N. Y. C.; G. W. Lieber, superintendent of reclamation, M-K-T; I. C. Bon, superintendent of reclamation, Wabash; R. D. Crawford, general storekeeper, Gulf Coast; T. S. Edgell, division storekeeper, M. & O.; J. S. Genther, general storekeeper, L. & N. E.; Charles Galbraith, chief clerk to purchasing agent, O. S. L.; J. J. Jordan, storekeeper, D. L. & W.; C. N. Lammers, supervisor of reclamation, C. & E. I.; J. L. Ortner, chief shop inspector, Erie; E. J. Remensnyder, assistant purchasing agent, Penna.; F. S. Austin, purchasing agent, B. & A.; D. B. Allan, reclamation inspector, U. P.; E. J. Becker, traveling storekeeper, S. P.; L. L. Studer, inspector of stores, M. P.; W. P. Stewart, superintendent of scrap, I. C.; C. A. Malone, general purchasing department, A. T. & S. F.; and C. B. Tobey (chairman ex-officio), general storekeeper, L. V.

Discussion

J. C. Kirk (C. R. I. & P.): Has the committee any information as to the number of roads that have adopted the scrap classification that was adopted in 1927?

Mr. Prentice: We haven't received any information as to the number of roads, but during the past six months, more roads have been adopting it every month, and those that have not adopted it in its entirety have taken out certain classifications with the same number as given by the A. R. A. and have adopted them.

J. G. Stuart (C. B. & Q.): Would Mr. Prentice give the costs over again?

Mr. Prentice: When the locomotives were demolished, in 1927, the cost was $3.02 a ton. This year's demolition so far averages $2.90 a ton. That is the complete job of cutting everything to charging-box size, and so on.

Mr. Stuart: That is about $300 an engine?

Mr. Prentice: Yes.

E. H. Polk (S. P.): At what location do you cut up your locomotives?

D. B. Allan (U. P.): They were cut up in the machine shop, where we had the benefit of the overhead cranes.

J. T. Goodloe (Southern): In this reclaiming of good material, I should like to ask what class of labor Mr. Allan used. They will not let us use any but mechanics on that.

Mr. Prentice: On the New York Central, all reclaiming of material is done by mechanics. Those mechanics are paid the standard rates. We probably do a lot more with helpers than you do in big shops, because we have more work that comes under that category.

Mr. Stuart: We tear down locomotives at the scrap dock and do not use any mechanics at all. Practically everything is done by laborers at 35 cents per hour. It is, of course, difficult to make any comparisons because engines are different, and of course the cutting up is different. For example, we do not cut up the boilers. We split them into halves, and use them for moving our scrap around. If you haven't been doing that, you will find that they are good containers for small scrap to be picked up with the crane for moving. It is cheaper to do that than to do it with the magnet. We figure that to tear down an engine, say, of about 110 tons, scrap it, cut the scrap ready for market, take out the usable material (we are not equipped for dismounting the drive wheels) takes about 42 to 50 man-hours. It is practically all done on a piece-work basis, and, of course, our man-hours are cheaper than where we have to use mechanics.

Mr. Prentice: For locomotives on which we do not use mechanics, we use mostly laborers. We do use a few burners. They work at the rate of 60 cents an hour. Mr. Stuart's rate is 35 cents an hour; ours is 55 cents an hour for labor in the Cleveland market. The big difference, of course, in cutting down any scrap, is in the preparation. By checking up the price we can obtain for boiler tubes with the pipes uncut, the price we obtain is so much greater that it more than offsets the extra cost in demolishing the locomotives. I think the big majority of the roads which are represented on this committee have found it profitable to prepare this scrap to the higher classifications, instead of selling it as boilers uncut, or tanks or fireboxes uncut, tubes for flues and pipes, or Number 2 and Number 3 cast. The more you prepare your scrap, the more it is going to cost, but the larger the return you are going to get for your scrap on the market.

Mr. Allan: I should like to ask Mr. Stuart what his cost was per gross ton of demolishing locomotives on this piece-work basis.

Mr. Stuart: It is just a little less than 50 man-hours for each locomotive.

A. B. Lackey (Southern): How much more is realized in cutting the scrap to the higher classifications than when it is sorted out ordinarily?

Mr. Prentice: That depends on the location. In the market through Pittsburgh, Youngstown, Cleveland, or even in the Chicago territory, I don't believe you will get more for an uncut boiler than 60 to 65 per cent of the heavy milling steel price. You can cut it up a whole lot cheaper than $4 or $5 a ton. There is no reason why a railroad should have any larger overhead than a steel company or a scrap dealer, if they run the scrap business in the same businesslike manner that they run their locomotive or car shops.

J. L. Irish (O. W. R. & N.): On what railroad is this reclamation of crankcase oil being done?

Mr. Tobey: You are using one process and we are using another. The results we have gotten so far have been very good.

Mr. Irish: Is this oil brought back to its original viscosity?

Mr. Tobey: Practically.

Mr. Irish: Do you use the sulphuric acid treatment?

Mr. Tobey: No. Ours is a combined chemical-electrical treatment.

Mr. Irish: What is the approximate cost per gallon?

Mr. Tobey: About eight and a half cents. That is as near as we figure at the present time. It has only been in operation about two and a half months.

Mr. Irish. Does it pass the laboratory test?

Mr. Tobey: It has been put back in the electric rail cars and used with no complaints.

Mr. Irish: You find no deposit or foreign deposits left in your oil?

Mr. Tobey: No, there is no more foreign substances in the oil after reclamation than there is in the original oil.

E. W. Peterson (Bangor & Aroostook): In cutting up the firebox to charging-box size, do you cut all the staybolts down to the smallest one, six or seven inches, so that they will lie flat in the charging box?

Mr. Prentice: The New York Central does not. We leave the staybolt in. Some other lines cut the staybolts down to about six inches.

When you are selling railroad scrap you have to remember you are selling the highest grade of scrap that is produced, and the boiler scrap will run less than one-half of one per cent of what you are selling, and it is accepted in that small proportion. You ought not to have much difficulty if you explain to the people to whom you are selling, the percentage that it runs.

Mr. Peterson: The scrap classification calls for the staybolts to be cut. We haven't been doing it, but there

has always been a question as to whether or not there would be a claim.

Mr. Prentice: That was put in the classification on account of matching the A. R. A. classification with the classification adopted by the National Association of Purchasing Agents, and it was put in there really to protect the purchaser. It would not be fair to sell a car of heavy milling steel consisting of boiler scrap entirely.

In this classification of heavy milling steel, there is another specification that boiler scrap cannot be longer than three feet, and that is put in because some people, in cutting their boiler, cut it in sections of 18 inches. A piece over three feet long will stick above the edge of the charging box. We cut it in 6-ft. dimensions. I don't think you will have any claim if you do not sell a straight carload volume of scrap as Number 1 heavy milling steel.

The report was adopted as read without further discussion.

Report on Station Supplies and Printing

Procedure of standardizing outlined—Centralizing endorsed—New devices described

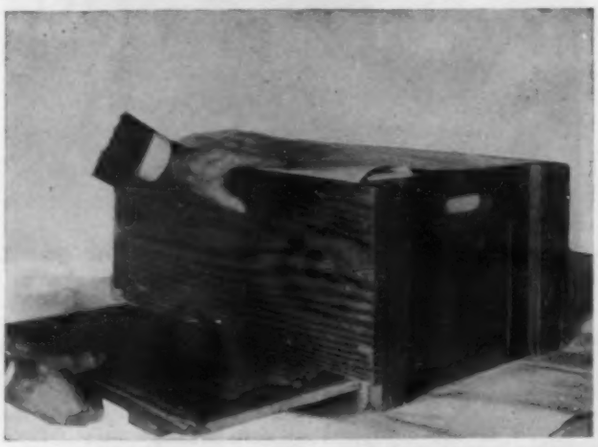
V. R. Plank
Chairman

There should be a stationery standardization committee on every railroad. The aim of this committee should be the adoption of efficient standardized practices, which will permit of using common standard materials and supplies, resulting in reduced purchase costs and a reduction in money expended for wages.

There will also be a reduction in stationery costs by reducing the weight, size and grade of papers, elimination of colored stocks, expensive ruling jobs, etc.

A committee to determine the necessity for forms and write up specifications should be furnished with information outlined in a questionnaire, as follows:

1. Quantity of form in stock. Disposition (scrap or use up).



Removable Bottom Box for Assembling Stationery for Wrapping

2. Quantity of form recommended to be ordered. Estimate average monthly requirements.
3. At whose request is form proposed, or old form revised?
4. Will form be permanent or temporary? Issued (daily, weekly or monthly).
5. Will the form, serve a purpose which warrants the expense of compilation and subsequent handling?
6. If form takes the place of an existing form, give reference to existing form.
7. What is the purpose of the form and what will the information be used for?
8. In whose office will form be compiled?
9. To whom will original be forwarded?
10. To whom will copies be forwarded?
11. How many of each sheet are used in making one report?
12. Is the information on the form shown in whole or in part on other forms? If so, (a) give reference to such forms. (b) name of department compiling, (c) to whom sent.
13. Specifications for paper and ink: (a) quality of paper, (b) size of form, (c) weight of paper, (d) ink, color and kind.
14. Is the title now appearing on form clearly descriptive?
15. Do column headings clearly and briefly describe the information to be shown?
16. Have you reviewed the form to see whether all columns are required? (If all columns are not required size of form can be reduced, or columns widened for more convenient spacing.)
17. Will the form be written on the typewriter, or with pencil or ink? If on the typewriter do the columns fit the typewriter spacing?
18. How are copies produced (schapirograph, letter press or carbon)?
19. Remarks.
20. For what period of time is it necessary to keep this record according to I. C. C. Rules?
21. For what period of time is it necessary to keep this record for railroad requirements?

Printing and Paper

In handling requests for new forms and revisions of existing forms consideration should be given to the various methods of printing and reproducing forms and the grade and size of paper required. An effort should be made to standardize on:

(a) Grades of paper suitable for service required of forms.

(b) Sizes of forms so that they may be cut to the best advantage from standard sizes of paper. Standard sizes are:

	Inches		Inches
Cap	14 x 17	Folio	17 x 22
Double Cap	17 x 28	Double Folio	22 x 34
Double Double Cap	28 x 34	Medium	18 x 23
Crown	15 x 19	Double Medium	23 x 36
Double Crown	19 x 30	Royal	19 x 24
Demy	16 x 21	Double Royal	24 x 38
Double Demy	21 x 32		

(c) Printing process most economical for service required of forms.

(d) Ruling of forms so that they may be used to advantage in typewriters or adding machines where necessary.

A Special Tool for Wiring Boxes for Shipment

(e) Color of ink used in ruling. Copying ink or colored ink shall be used only when necessary.

(f) General arrangement of blanks, so that printed matter will

not interfere with file reference, perforations, etc.

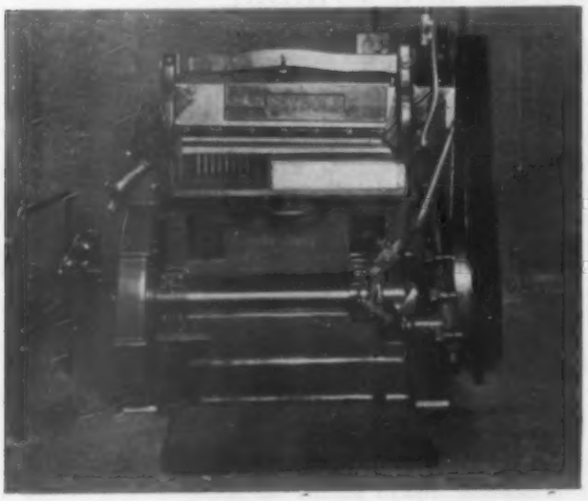
(g) Whether or not forms can be printed on both sides to advantage.

(h) When the form consists of more than one sheet the sheet number and total sheets comprising the blank should be shown beneath the form number, for example:

L-3051
Sheet 1 of 4 sheets
or, Sheet 4 of 4 sheets

Quality of Paper

Railroad forms are generally printed on newsprint, manilas, machine finish book, bonds and ledgers.



Paper Cutting Machine

The use of newsprint, in the lighter weights No. 14 and No. 16 can be extended to large number of forms filled in with pencil, ink and typewriter and it is recommended that consideration be given this grade of paper, or paper of the cheapest quality consistent with its use.

Newsprint is now stocked by paper houses and railroad printers in the several commercial sizes. It is being successfully used for mimeograph printing, effecting a considerable saving over the cost of mimeograph paper and it is recommended that this grade of paper be used for mimeograph printing.

One of the member lines has standardized car cards to a numerical card. The cards are 3½ in. by 5½ in., cut from 22½-in. by 28½-in.—186M Anchor Manila Tag Board. Numerals are printed on this card from 1 to 99 in red ink. Width of numerals ⅝ in.; height is not less than 3 in. A red bar across bottom of card prevents mis-reading of such numbers as 66, 99, etc. Numerals are conspicuous and aid yardmen in switching cars. Each yard for handling business, grouping cars, making up trains, is supplied with sufficient cards in numbers as required. The numbers are interchangeable since all yards can use the same numbers. This makes the car card a flexible stock item.

Hand Lift Truck and Portable Containers for Paper Handling

Printing car cards all on the same card stock, the same size, one color, greatly reduces the cost of printing. Some yards have their yard clerks and callers write in numbers. Such cards are not as satisfactory as the printed heavy numeral card and the labor of writing up cards adds considerably to their cost.

Envelopes for Tariffs

The committee recommends the use of envelopes on the face of which is lettered "Printed Matter" for use in mailing out tariffs as third class matter.

Central mailing bureaus should mail all tariffs. Those for agents and others on the company lines should be pouched in regular string open side envelopes. Size 12½ in. by 10 in. should be used in regular service between offices and mailing bureau. For tariffs mailed to commercial concerns and other roads envelopes 11¾ in. by 8¾ in. with an open end should be used. For small issues of tariffs the ordinary No. 10 plain envelope can be used and rubber stamped "Printed Matter."

Paper Tying Machine

Pencils

Pencils are one item of stock that is exceptionally difficult to control unless there is some systematic method in use. One line has had in operation for the last 14 years a list which shows the kind and quantity of pencils to be furnished the various offices. This list is kept in the stationery storekeeper's office and is referred to when censoring stationery requisitions.

The use of pencil lengtheners to secure the maximum service of a pencil is recommended. The ordinary pencil is seven inches long and under ordinary usage, it is discarded when it is reduced to about three inches.

A mechanical pencil is a labor saving device. However, unless the leads are judiciously distributed the leads will cost more than the regular lead pencil.

Loose Leaf Books

Car record books should be made up loose leaf. The loose leaf not only is less expensive, but more efficient to handle than the large bound book. All bound books should be considered with view of adopting loose leaf.

As a measure of having records removed from record rooms, filing cabinets, etc., there should be a record in each office showing the length of time each record is to be retained.

There should be standard specifications used by Railroads for labeling and packaging of printed forms, plain paper, ruled paper (both loose and padded), carbon paper, books, binders, envelopes, rubber bands, twine, tags, etc.

Instructions outlining the plan to be followed in inspecting stocks of stationery should be issued to those detailed to handle this work.

Centralizing Stock

Stationery is a commodity that can be centralized at one point on a railroad. The stationery store, should be geographically located for service and the stocks should be received, inspected, and distributed by this store. Centralization of supervision, inspection, control, and distribution by a trained organization will result in getting the quality and quantity, specified economical handling costs, and minimum investment.

In large offices much duplication in labor will be avoided by the establishment of central bureaus for the handling of stationery, mail, filing, mimeographing, typing, calculating, etc. Such bureaus will not alone reduce pay roll expense, but will also effect economies in the use of stationery and supplies and postage. Such bureaus will also do much toward the increased use of re-use envelopes.

Reclamation

All forms that have become obsolete and old tariffs that are blank on one side should be returned to the stationery store where they can be either used for printing forms on the blank side, cut up for clip paper, or sold.

Old records bound in binders or binding cases should be returned to the stationery store. The records can be removed from binders, some used for clip paper after cutting on the paper cutter and the balance sold for waste paper. Second hand binders can be reissued instead of purchasing new. Savings in this activity on a railroad should run into several thousand dollars annually.

Shop memorandum cards used by mechanical departments in making notes and sketches in the shops can be made from old records and obsolete forms. Binders that have been badly worn at the corners can be cut down to smaller sizes on a paper cutter, and this method will eliminate the purchase of new binders.

Controlling Line Stocks

Stationery is charged to operating expense as soon as it is shipped from the store. It is, therefore, important that this line stock be controlled with some well defined system. A properly maintained stock book is a reliable guide for the inspection. With this book not only the division storekeeper, but the trainmaster, traveling division auditor, transportation inspector, can by examination of a few forms quickly determine the condition of stock on hand at the point inspected.

Labor Saving Tools

Labor saving tools and service are important factors in keeping stationery costs on a railroad at a low level.

The market affords a number of standard labor saving devices that effect economies in a stationery store.

A portable elevator best suited for requirements should be provided in handling heavy cases of paper stocks. One of these elevators will reduce labor costs in the handling and storing of heavy commodities. It will also effect considerable savings in storage space.

An automatic paper cutter is an economical tool in a stationery store for cutting paper stocks, cardboards, clip paper, and other reclamation and conservation work.

An exceptionally handy tool is a table on wheels or casters. Such tables are used by the receiving stockman, paper cutter operator, section stockman, order fillers and packers. These tables are a combination ledge, table and ladder, and are equipped to handle refuse. Eliminating ladders, refuse cans and rack ledge makes them extremely valuable.

Steel racks for handling stationery are very satisfactory, by permitting spacing for any quantity of forms.

A special table is used for padding clip paper. Three stacks of clip paper, 286,000 sheets, size 5 in. by 8 in. can be placed on this table at one time. Holes are bored through the ends of the top of the table for bolts. A board is placed on the top of the paper to be padded and this paper is compressed by the means of wing nuts clamping down the board. Cases received at stores are sometimes old and full of nail holes and it is difficult to fasten boards back by nailing. A tying machine is available for this purpose. Two strands of wire around one of these cases will hold the cover and contents intact, as well as, save nails.

Portable bins can be used for various purposes. Old records can be sent to the stationery store and any that are clear on one side can be placed in bins, which can be handled by a lift truck to the paper cutter for cutting paper for scratch pads. Obsolete tariffs turned over to the stationery store can be stored in these bins until they are cut up for scratch pads or sent to a duplicating bureau for printing forms on the printing press, mimeograph, multigraph, or, otherwise, using cheapest method possible. These bins can be used for handling waste scrap paper and sweepings collected during the day by having an end or door constructed that will fit the open end of the bin.

These bins can also be used for taking care of board covers off cases of stationery received from printers. Shelving is made out of pipe and various lengths dunnage is kept segregated. This dunnage is used with reclaimed cases for shipping stationery ordered by large offices.

These bins can also be used for consolidated shipments. They can be placed handy to the wrapping tables and as the packages are wrapped, placed in these bins and when filled taken direct to the car by lift-truck. This method eliminates extra handling of shipments to the extent of reducing labor costs.

A lift-truck is an economical tool for use in handling bins and platforms, loading and unloading cars and trucks, handling refuse, old records, etc.

A packing box used for assembling stationery is a factor in reducing store expense. These boxes are placed on tables and stock called for on requisitions is placed in them in such shape that the package can be wrapped for shipment without further packing when taken to the wrapping table. The box has a removable bottom which is pulled out, releasing the contents. The box can be taken off the package leaving it intact for wrapping.

The report is signed by V. R. Plank (chairman), stationery storekeeper, S. P.; H. C. Boldebuck, stationer, C. B. & Q.; D. Delaney, stationery storekeeper, C. & A.; J. E. Hobson, stationer, Sou.; A. B. Rutherford, stationer, U. P.; F. J. Mayer, stationery buyer, I. C.; D. E. Viger, stationery storekeeper, B. & A.; W. W. Griswold, stationer, C. R. I. & P.; E. J. Lamneck, asst. purchasing agent, Penn; F. Blanchard, Jr., stationery storekeeper, B. & O.; W. A. Clem, asst. purchasing agent, Reading; C. C. Anderson, stationer, N. P.; A. D. Sturley, stationer, G. N.; J. L. Woods (chairman-exofficio), purchasing agent, N. C. & St. L.

Discussion

W. S. Morehead (I. C.): The fifth paragraph on page 10 refers to delivery of stationery to train crews. In the first place, I think this should be stricken out of the report for the reason that Subject 15 takes care of delivery of material to users. In the second place, I don't believe this is practical. I move that it be stricken out of the report and be referred to the committee on Subject 15 for further consideration.

Mr. Plank: Did you ever try putting stationery on freight cabooses?

Mr. Morehead: Whatever it costs to deliver stationery to train crews, it is costing you more than it is costing us, because our train crews call for their stationery and they don't get paid for doing it.

Mr. Plank: Who handles it, the train master? He handles it in pretty good shape and keeps it in good shape. Stationery has been put on cabooses on the line I represent for seven years and it is put on by the supply man that supplies the brasses and miscellaneous items of supplies, but it might be not in order for this report.

Mr. Morehead: That is the point I bring up. It is out of place here.

Mr. Plank: I should like to accept the correction to have it put in its proper place, but I want it understood that I think this practice should be investigated by everybody because it has reduced the cost of stationery on the line I represent just about 50 per cent. It has eliminated the waste that has accrued through the other practices.

The motion was seconded and on vote, was lost.

Mr. Murphy (N. Y. C.): I want to ask a question about this $4,500 saving that you mentioned as having been effected on envelopes. What was that?

Mr. Plank: That is a reduction in the purchases of envelopes in one year. Had they not used this repeat envelope, or re-use envelope, which is used from 25 to 50 times, depending on how active they are in its use, they would have had to purchase $4,500 more envelopes than they are doing now. That is based on before and after taking. I don't know what the total cost of envelopes was. This takes in all envelopes.

Report on Delivery of Material to Users

Increased use of motorized equipment recommended———Centralizing all shop hauling advocated

J. L. Irish
Chairman

Delivery of material to the users was first taken up as a separate subject in 1921, and has been a live subject each succeeding year.

Investigation discloses that congested districts and terminals are being supplied by supply train, supply cars and motor trucks with trailers, the method used, being governed by local conditions and the cost of deliveries.

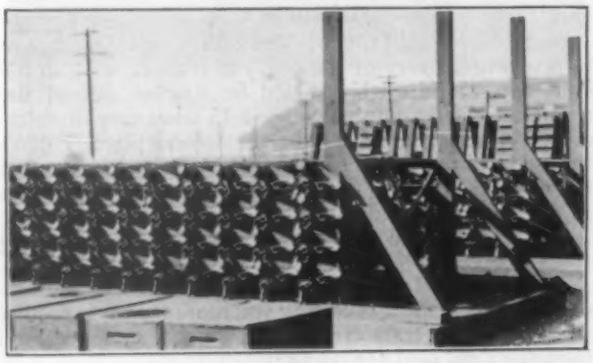
The Committee recommends that motorized equipment should be used where practical. One Class I road, before placing motorized equipment in service for making such deliveries in a congested district, computed the comparative cost as follows:

By Work Train—2 Days	
Train crew salaries	$ 69
Engine crew salaries	48
Supplies for engine	63
Cars per diem of 6 revenue cars—four days	24
4 laborers from storehouse	28
1 supply car clerk	21
1 helper	8
Total	$251

By Auto Truck—4 Days	
1 chauffeur	$ 27
2 laborers	30
1 supply-car clerk	21
Cost of truck	40
Total	$119
Net saving	$131

Equipping Supply Trains with Cranes

One road has recently improved its service through the purchase of a gasoline crane with a magnet which is used exclusively for picking up scrap and unloading heavy materials by supply train.



Brake Beam Storage on Union Pacific

This crane operates on the top of a flat car, and is equipped with a 60 h. p. gasoline engine, 40 ft. boom, 36-in. magnet and 5½ kw. generator. It has a capacity of 7 tons, and a lifting radius at various distances varying as follows: 9200 lbs. at 15 foot radius, 5900 lbs. at 20 foot radius, and 3100 lbs. at 30 foot radius.

Oil House on M-K-T Showing Four-Compartment Packing Vat and Motor Driven Pump in Background

On the first trip with this crane two work train-days were saved, and one work train-day of actual work that would have been necessary to pick up the scrap and second hand rail from a relaying job. By having this crane in the supply train, it was possible to pick up this rail piece by piece from the point where actually released without any extra cost of operating the train. At another point 88 lengths of rail were picked up over a distance of one-half mile in exactly 37 min. At terminals where the supply train lies over one day, this crane is being used to load straight carloads of car and locomotive scrap and second-hand loose and mounted wheels formerly loaded by hand or with small air cranes.

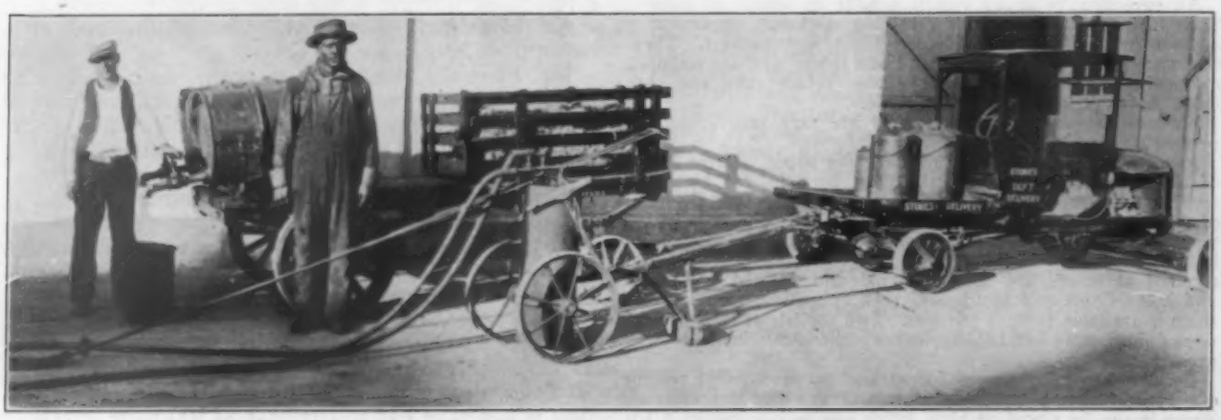
The practice of carrying a crew of laborers with the supply train to load scrap has been entirely discontinued and in addition there is a saving in time of section forces at the tool house, their scrap now being loaded quickly with the magnet.

Previously, scrap rail and frogs were picked up with small air cranes. All other scrap was loaded by hand. There is no comparison between the two methods of handling. Under the former method it was not possible to pick up large quantities of rail on account of the delay to the train.

Stores Delivery

Replies from 76 roads indicate that 49 railroads have the Delivery-to-Shop system in effect. Five are using this system partially, while 22 do not.

The committee recommends that the stores department also



Equipment for Delivering Oil and Waste on Southern Pacific-Texas Lines

handle inter-shop delivery which consists of moving material from one department to another or from one point in any de-

Magnet Equipped, Gasoline Operated Crane in Supply Train Service on Southern Pacific

partment to another point in the same department. This can be most economically moved by motor equipment, trailers and skids. Replies from 76 of 80 railroads indicate that on 14 railroads

Concrete Roads for Handling Material on the Illinois Central

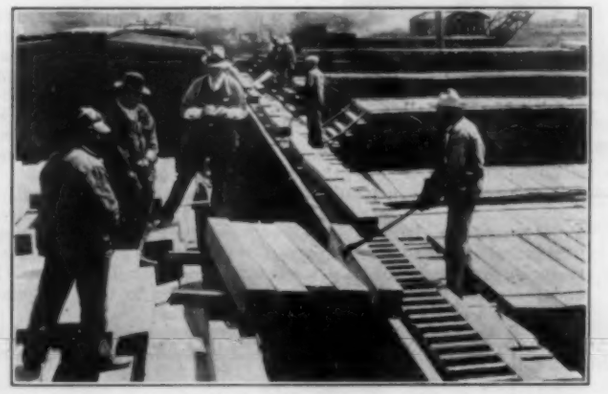
the stores department have this arrangement in effect. Three are using this system partially, while 59 do not use it.

Caboose and Engine Supplies

The committee recommends that supplies for cabooses be delivered under the supervision of the store department. If further recommends that a standard list of equipment and supplies approved by the chief operating officer be adopted, the

Material Handling on Dirt Road, After Rains

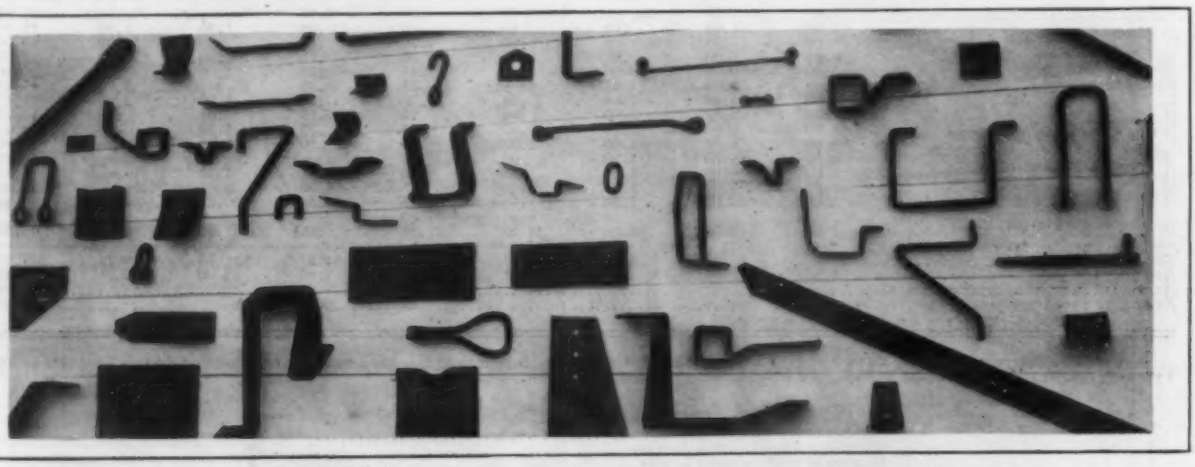
caboose checked each trip and the supplies made to conform to the list. On one Class I road certain equipment not used each trip is arranged in lockers or compartments which are kept sealed, thus eliminating the necessity of checking unless the seal is broken. Replies from 76 of 80 railroads canvassed indi-



Handling Lumber with Roller Conveyors

cate that on 40 railroads the stores department take care of supplying cabooses. Three roads do so at one point only, while 33 do not handle the work this way.

Replies from 76 of 80 railroads canvassed indicate that on 8 railroads the stores department supply the locomotives. One road does so at one point only and another at some points, while 66 do not handle the work otherwise.



Products of Reclamation on the Missouri-Kansas-Texas

Motorized Equipment

There is on the market today equipment such as tractors, both electric and gas operated, some being equipped with lifting apparatus, others with crane attachments, etc., which are well adapted for the safe and economical handling of materials. However, there is in use on various roads equipment designed and made in the shops for handling material that is beneficial.

One of the important duties of the stores department is to deliver material to the users. In order to obtain the maximum efficiency, good roads should be provided. The committee is of the opinion that concrete roads, on account of efficiency and permanency, should be recommended.

The cost of constructing concrete roadways vary because of local conditions, but the committee recommends that contemplated roads be definitely located and charted, taking into consideration future developments. An estimate should then be obtained from the engineering or construction department after thoroughly going over the premises with such forces.

The report is signed by J. L. Irish (chairman), general storekeeper, O. W. R. & N.; W. S. Morehead, assistant general storekeeper, I. C.; J. V. Anderson, assistant district storekeeper, C. M. St. P. & P.; M. E. Baile, district storekeeper, M. P.; C. H. Kelly, district storekeeper, L. V.; C. H. McGill, supply train storekeeper, N. Y. N. H. & H.; E. S. Clapp, traveling storekeeper, C. & N. W.; Grover Wonnell, storekeeper, Penn.; J. C. Neph, general inspector of stores and supply train service, S. P.; J. J. Hansen, division storekeeper, U. P.; Frank McGrath, traveling storekeeper, B. & M.; J. W. Wade, general storekeeper, N. & W.; J. W. Gerber, general storekeeper, Sou.; T. J. Hegeman, superintendent of reclamation, C. B. & Q.; and C. C. Kyle (chairman ex-officio), purchasing agent, N. P.

Report on Uniform Accounting of Material

Joint work with accounting officers explained and program of work outlined

U. K. Hall

The committee has noted carefully the report of the committee on this subject for the previous year, and of the joint committee with the Railway Accounting Officers' Association and we find there is little additional to be brought up at the present time.

Material Stock Report

In connection with the subject, the committee prepared a tentative report containing some discussion and some recommendations on the subject. That tentative report was informally submitted to representatives of the Railway Accounting Officers' Association. Our attention was called to some inaccuracies or erroneous conclusions.

The inaccuracies in tabulations were due to the abstract manner in which replies were make to the committee's questionnaire. Your committee gladly takes this opportunity of calling attention to this and also that the compilation of the returns from our questionnaire was designed only for information within Division VI and therefore deprecates the application given to that compilation outside of the Division.

The Railway Accounting Officers' Association has appointed a special committee of three chief accounting officers for the purpose of a thorough joint investigation as to this matter, and it is the recommendation of your committee that the chairman, at a later date, appoint a special committee of three members to work in conjunction with this accounting committee. Final report will be made after study by this joint committee.

Working Stocks

In connection with this subject, we recognize the feasibility of working stocks, as mentioned on pages 184 and 185 of the May, 1927, Proceedings of this division, which were approved by the joint committee of the Railway Accounting Officers' Association.

Basis of Comparison

We find there is still a continued effort to work out a basis of comparison of stock investment, including such comparisons as train miles, engine miles, tons one mile, etc. We would, however, call attention to report of the joint committee with the Railway Accounting Officers' Association, as reported on page 189 of the May, 1927, proceedings, reading:

"A comparison between roads should be on the basis of turnover."

A thorough study and investigation proves to this Committee that this is the only basis that makes toward a just comparison.

No Division of Account 716 Contemplated

In connection with this report, your committee desires to again

Exhibit "A" To Report on Subject 19—Carrying Cost of Material and Supplies Investment

ROAD	Interest on Material and supplies investment, per cent.	Cost of handling	Obsolescence	Taxes	Insurance	Interest on investment in stores facilities	Deterioration depreciation and wastage	Transportation over own line	Total percent
A	6.00	6.16	No reply	Inc. in No. 6	.30	0.40	No reply	No reply	12.86
B	6.00	8.00	.10	.10	.50	1.00	1.00	2.00	18.70
C	5.00	7.00	.50	1.00	.50	.50	.10	13.00	27.60
D	6.00	5.00	.07	2.75	3.50	.75	.50	3.00	21.57
E	5.00	9.00	2.00	2.10	.25	.25	1.00	.50	20.10
F	6.00	5.00	1.67	No reply	.25	.50	No reply	2.00	15.42
G	6.00	4.40	4.00	.50	.25	.40	1.00	2.00	18.55
H	6.00	3.00	2.00	.50	.90	.25	.03	.03	12.75
I	5.00	5.00	2.00	.60	.25	.30	1.30	.50	14.95
J	6.00	6.50	1.00	2.00	.50	.50	1.00	.20	17.70
K	6.00	9.00	1.50	.67	.20	No reply	No reply	No reply	17.37
L	6.00	6.00	2.00	.50	.20	.02	1.50	No reply	16.22
M	6.00	7.00	3.00	2.00	Inc. in No. 2	6.00	3.00	No reply	27.00
N	3.00	5.00	1.00	.75	.75	3.50	.50	5.00	19.50
					*2.00				
O	5.00	3.00	4.00	(1.00	.50	.50)	1.00	2.00	17.00
Totals	83.0	89.06	24.84	14.47	8.85	14.87	11.93	30.25	277.29
Average of all roads replying	5.53	5.94	1.77	1.11	.630	1.06	1.00	2.75	18.486
Average of 10 roads replying complete									18.842
Average of 5 roads replying in part									17.774

*NOTE—This railroad in reply set up 2 per cent covering Items Nos. 4, 5 and 6. Inasmuch as this was a complete reply we divided this 2 per cent as follows: 1 per cent Item 4, and 5 percent each Items 5 and 6 in order to complete detail of these three captions.

Recapitulation

Number of roads solicited	33
Number of roads replying complete	10
Number of roads replying in part	5
Number of roads information not available	3
Number of roads not replying	15

emphasize the fact brought forth in committee report for the year 1927 as reported on page 172 of the 1927 proceedings, as follows:

> No division of Account 716 on the general books of the railroad companies is recommended by this Committee, but proposal submitted does provide for furnishing certain monthly statistics from the present classified material balance sheets, to the Secretary of Division VI of the American Railway Association.

In order to clarify, your committee desires to emphasize the distinction between "Account 716 General Balance Sheet" and the "Classified Material Stock Report." The former is the generl balance sheet as prescribed by the Interstate Commerce Commission, the latter being monthly statement by clsses of materials, prepared by individual railroads for their own requisite and use.

Some confusion undoubtedly was caused by reference to "Balance Sheet," being construed as meaning a balance sheet reported by the accounting officers to the Interstate Commerce Commission, while as a matter of fact what was intended to be compiled was the clssified balance sheet, or material stock report.

Recommendations Covering Charges to Material Store Expenses

The report of Committee at the May, 1927, Convention, instructs that the Committee for the following year:

> Prepare rules and procedures for all detail items which may be included in Stores Expense, and enumerate them.

After thorough consideration of the subject, it is the opinion of this committee that at the proper time such a detail list should be prepared in joint conference with the joint committee of this division and the Railway Accounting Officers' Association, and we so recommend.

We understood the Railway Accounting Officers' Association are giving consideration to the recommendation for establishment of primary operating expense account to be known as "Material Store Expense," and at a later date the matter will undoubtedly be considered with you joint committee.

Carrying Cost on Material and Supplies Investment

This subject for this year was assigned to committee on subject 4. We find that in 1927 the committee on subject 19 "Carrying Cost of Materials and Supplies Investment" made a very thorough study and detailed report of such carrying cost. We have not deemed it necessary to go into this subject again as to the detail list of items entering therein, accepting the previous report as being as near the actual facts as any new committee could compile.

Account of the importance of this matter, and in order to keep it constantly before us, we are reprinting chart showing the findings of the committee in report rendered last year on this subject. Exhibit *A*.

We desire to emphasize this, realizing that these figures have no standing as an accounting department proposition, but are for educational purposes only. The handling and other out-of-pocket costs are taken care of by charges to proper accounts according to accounting instructions. We do desire, however, to keep continually and constantly before the users of material the fact that it is costing our companies from 18 to 20 per cent per annum for our stock investment. We feel that these figures should be furnished the heads of the using departments and a constant campaign of education be followed to assure of all concerned being familiar with this usually unnoticed cost of carrying materials.

Joint Committee

Your committee desires to express their appreciation of the opportunity of working in conjunction with the Railway Accounting Officers' Association through the medium of the joint committee from that body and your committee, and of the special committee above mentioned: also of the marked spirit of cooperation displayed by the Secretary and members of the Railway Accounting Officers' Association.

Our division was represented at the Annual Meeting of the Railway Accounting Officers' Association, in Denver, Colorado, in June, 1927, and in Atlanta, Ga., in May, 1928, and have been in touch with the committee throughout the year.

Moreover, the Railway Accounting Officers' Association have expressed their willingness to co-operate with this division at any time we may bring up questions for their consideration.

The report was signed by U. K. Hall (chairman), general supervisor of stores, U. P.; W. E. Brady, traveling accountant, A. T. & S. F.; O. A. Donagan, general storekeeper, B. & M.; D. V. Fraser, assistant purchasing agent, M. K. T.; R. D. Long, asst. general storekeeper, C. B. & Q.; O. B. Mills, asst. general storekeeper, Pennsy; C. H. Murrin, special accountant, I. C.; D. H. Phebus, inspector of stores, C. M. St. P. & P.; E. W. Peterson, general storekeeper, Bangor & Aroos.; A. L. Sorensen (chairman ex-officio), manager of stores, Erie.

Discussion

Mr. Hall (U. P.): The committee has been working right up until the very eleventh hour, although you may not think so when you see what we have accomplished. For that reason we have not been able to have our report printed for distribution. We have not entered into any particular investigation during this year. We did not send out any questionnaire. We based our calculations and work upon the questionnaires that had been sent out in previous years. Our work however, and we have done a whole lot more than will be evidenced in the report, has been mostly that of conference. Representatives of your committee attended the meeting of the Railway Accounting Officers' Association in Denver last year. Our secretary, Mr. Farrell, attended the meeting of the Railway Accounting Officers in Atlanta, Ga., this year. Your committee representatives met a number of times with Mr. Woodson, secretary, and Mr. Johnson, president of the Railway Accounting Officers' Association.

We want to emphasize and call attention to the joint committee that has been appointed by this convention consisting of three high accounting officers of three major trunk line railroads—H. W. Johnson, comptroller of the C. B. & Q., Mr. Baxter, general auditor of Santa Fe, and L. A. Robinson, general auditor of the N. & W. With the appointment of this committee, we feel that machinery has been set up, foundations laid, for excellent constructive work by the committee on this subject in the coming year.

F. H. Fechtig (A. C. L.): In view of the address by Mr. Powell this morning, approved by Mr. Aishton, president of the American Railway Association, it must be obvious to you all that there can be nothing more important than to bring to the minds of the executive officers of the railroads of this country each and every one in the Interstate Commerce Commission report, the charge of supplying each account. On the Atlantic Coast Line for the last 30 years the primary accounting tas been done in the office of the general storekeeper. Every month, there is reported to the comptroller the amount of money that must be charged to each account. It seems to me this committee can do nothing more constructive than to do its very best to have each one of these individual accounts reported on as to the material required.

H. H. Laughton (Southern): On the Southern the primary accounting is done at each division storehouse. Those reports which are sent to the accounting department are consolidated and an itemized statement of all operating expense is issued showing labor, material, vouchers, journal entries, total less credits.

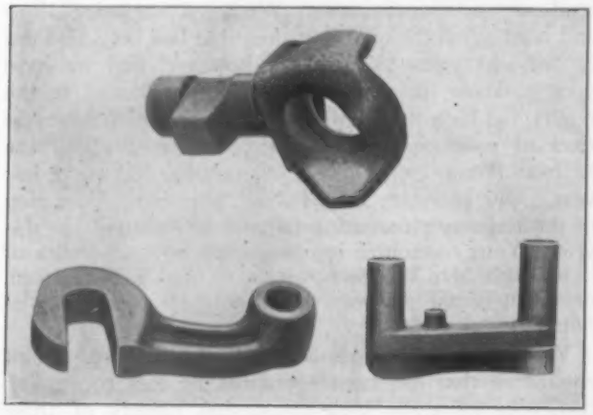
B. C. Hart (N. Y. N. H. & H.): The New Haven has a budget account and we go a little bit further. We furnish the mechanical people with daily accounting. In other words, on the following day we give the mechanical people the advantage of knowing what their expenditures have been on the previous day.

There being no further discussion the motion to receive the report as read was put to a vote and carried.

New Devices

Rotary Operating Device for Type D Couplers

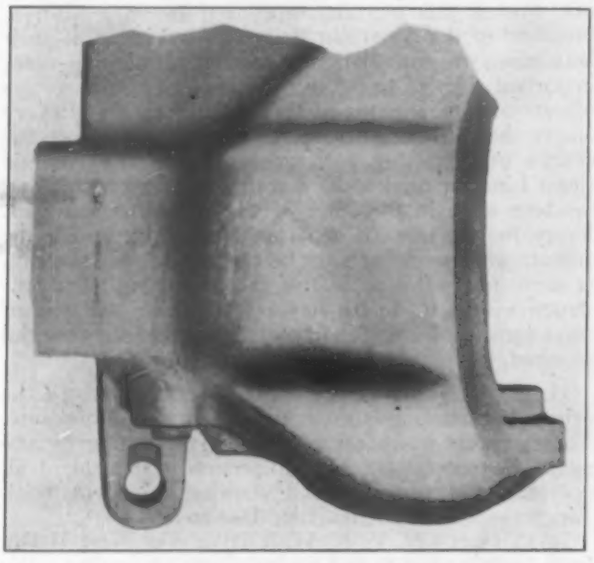
WITH the idea of increasing the ease of operation of the standard type D coupler as much as possible without impairing its efficiency, the Buckeye Steel Castings Company, Columbus, Ohio, has developed what is known as the rotary operating device for these



The Separate Parts of the Rotary Operating Device

couplers. This device forms a part of the company's exhibit. It is an arrangement for use in place of either the top lift or bottom operating arrangement for all types of freight cars.

The rotary operating device has been analyzed and tested by the Mechanical Committee of Coupler Manu-



Detail of Lugs Cast Integral with the Coupler Head for the Rotary Operating Device

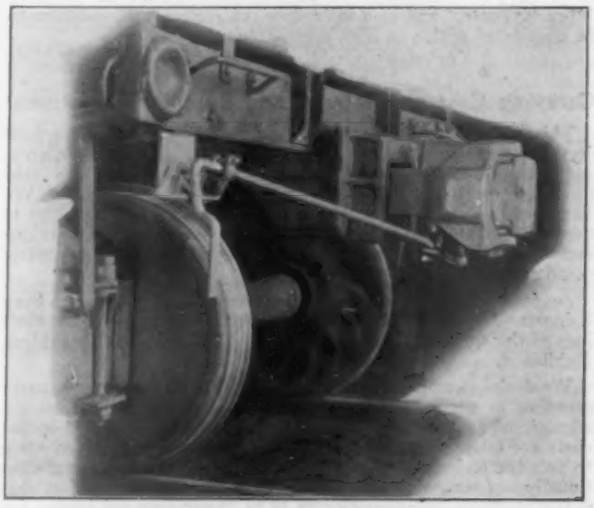
facturers and recommended for trial to the A. R. A. Committee on Couplers and Draft Gears. The A. R. A. Coupler Committee has now authorized this service trial and various railroads have now, or will have shortly, in service, upwards of 500 to 800 couplers applied with the rotary coupler device.

The only change in the type D coupler head itself is that two projecting lugs are cast on the bottom of the coupler directly back of the bottom lock hole. Attached to these lugs the basic parts of the operating gear are furnished assembled with the coupler. The only other parts necessary are the operating rod and one bracket which is placed on the corner of the car. The operating rod is a simple one-piece rod with a handle bent on one end and an open eye on the other.

The bracket on the car is designed to allow the rod to move sidewise with the coupler as it swivels in and out with the draft gear travel and also furnishes a stop against rearward rotation for the hand portion of the rod when the coupler is in any position.

The parts furnished with the coupler consist of a rotor, a lifter arm, and a link. They are drop forgings or castings and are easily assembled and are positively locked in position without the use of pins, rivets, cotters, etc.

The important feature of this device is that it greatly reduces the force required to operate the coupler. The reason for this is that the "mechanical advantage" has



Typical Application of Rotary Operating Device with a Type D Coupler

been increased and is the same no matter to what type of car the device is applied. A one-pound force at the hand lever produces a three-pound force at the lifter. The present types of uncoupling devices are so designed that the "mechanical advantage" in some is only 1.0 and in others more widely used types is not greater than 1.5. From this it will be noted that by means of the rotary operating device the "mechanical advantage" of the operating parts external to the coupler have been increased 100 per cent. to 200 per cent.

Another feature contributing largely to the ease of operation is that the rotary parts of the coupler itself reduce materially the friction on the lock. The direction of rotation of the lifter is more in direct alignment with the movement of the lock toe, so that the force delivered by the lifter operates the thrower in a line that is much

more favorably directed than in the case of either the top lift or bottom operating parts.

The tests made show that the type D coupler, to be operated with the operating rods now in general use, requires that an effort varying from 70 lb. to over 200 lb. be exerted at the handle of the rod. With the rotary operating device tried on the same couplers, this is reduced to approximately 25 lb. applied to the handle.

The advantages claimed for the rotary operating device may be summed up as follows:

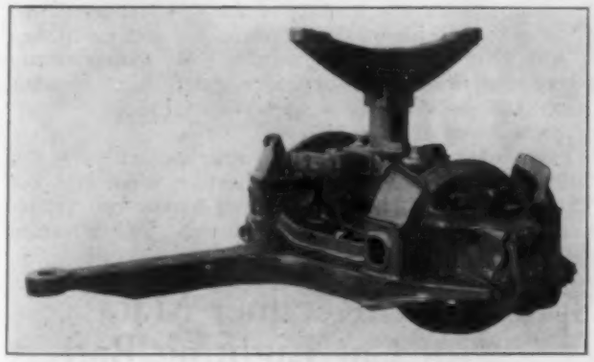
Reduces pull on handle of operating rod required to operate the "D" coupler from over 200 lb. to an average of 25 lb. depending upon the type of coupler operating device with which it is compared. A trainman can easily lock set the coupler with one foot while riding on the car.

Due to its lower position on the corner of the car, the rotary operating device is in an advantageous position to operate. The operating arrangement as a whole is simplified, as only one bracket and one rod are required.

The device consists of parts that can be drop forged and the wearing surfaces are larger than provided on the present bottom operating arrangement. All parts are locked in position without the use of rivets, pins, and cotters. It eliminates practically all of the wear between the lug and front lock guide which is one of the reasons for its ease of operation. The top lifter hole in the top of the head can be omitted or it may be closed with the present malleable cap used on the bottom operating coupler. This feature provides greater protection for the operating parts against dirt and the elements.

Alco Two-wheel Outside-bearing Engine Truck

A TWO-WHEEL outside-bearing engine truck is included in the exhibit of the American Locomotive Company, 30 Church street, New York. With the journals located outside the wheels, a lower overload is produced on the bearings as the truck swings over when



The Alco Two-wheel Outside-bearing Engine Truck

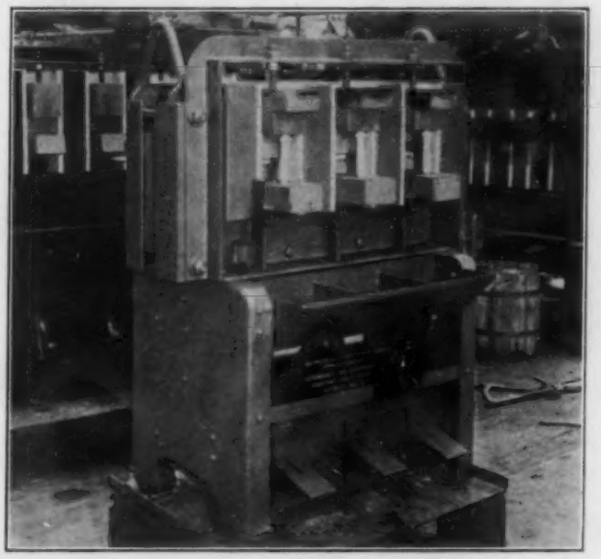
passing curves. The spread of the journal centers is the A. R. A. standard dimension so that standard axle forgings may be employed, and the journal brasses, wedges and journal box lids which go with the journal size may be taken from car-repair stock parts. The accessibility of the bearings for oiling and repacking is also increased, an item of importance on engines in long-run service. The journal boxes form a part of the cast-steel integral frame structure, thus eliminating the pedestals with their rapid wear.

The central elliptic spring, which rests directly on the swing bolster, eliminates the spindle and guide with its wear and maintenance. Ample space is provided for the renewal of piston packing rings and bolted fastenings are reduced to a minimum.

The centering device producing the lateral resistance, employs the Alco geared roller principle, wherein toothed rollers, meshing in roller seats, inclined to provide the proper centering effort, are yoked together to insure positive and simultaneous movement. To enable the truck to swivel about its radius-bar pin and at the same time to permit the rollers to move in a straight line, the spring seat is held central by links. The inner ends of the links are attached to an equalizer which swivels about the spring seat, while the outer ends are pin connected to the front deck casing. The movement of the centering device is, therefore, mechanically free with no tendency to bind at any point. Alco renewable hub liners are applied to take up lateral wear and reduce flange cutting.

Electric Rivet Heater with Dial Control

THE American Car & Foundry Company, 30 Church street, New York, is exhibiting a No. 3 Berwick electric rivet heater which has been considerably improved by the addition of a dial control of



No. 3 Three-Electrode Berwick Electric Rivet Heater

six heating speeds. This is one of the main features of the equipment that has been developed during the past few months.

With this heater, small rivets for cab and tender work, as well as mud-ring rivets up to 1 in. or 1⅛ in. in diameter and from 9 in. to 10 in. long, can be brought to the desired temperature for riveting. The six heating speeds provide the necessary control for the different diameters and lengths of rivets. The heater can be placed on wheels so that it can be moved around a locomotive and located in a position most convenient for the operators. The manufacturer claims a saving of from 50 to 70 per cent in the cost of heating rivets in addition to eliminating the possibility of burned and spoiled rivets.

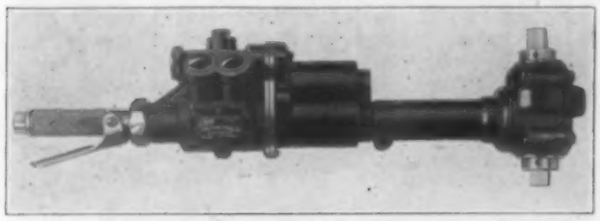
Transmission for Motor Coaches and Trucks

THE Brown-Lipe Gear Company, Syracuse, N. Y., is exhibiting several types of automotive transmissions for use on motor coaches and trucks. Of particular interest is a design of reversing transmission which, operating in tandem with the main transmission, gives the vehicles the same speeds in reverse as it has forward. Though designed particularly for use in gasoline rail cars, this reversing transmission has also proved a valuable addition to tractors and heavy-duty trucks when used under conditions which require lengthy operation in reverse.

For motor coach use, the company is exhibiting its Model 51, five-speed unit-power-plant transmission, equipped with a clutch having fibre driving discs and a basket drum. The low speed is lower and the high speed is higher in this transmission than in a standard four-speed transmission—factors for easier starting and faster traveling. The clutch is said to be quieter and more powerful than one with steel driving discs.

Thor 71 R Pneumatic Wrench

A NEW tool designed especially for removing and running up nuts from ½ in. to 1 in. on locomotive and car construction and repair work has been developed and is being exhibited by the Independent Pneumatic Tool Company, 600 West Jackson boulevard,



Thor 71R Pneumatic Wrench

Chicago. The Thor 71 R pneumatic wrench, as it is known, is especially adapted for locomotive work in putting on and removing 1-in. cylinder nuts, 1-in. dome nuts, and ¾-in. and ⅝-in. front-end nuts. It is also designed for work on a wide range of nuts on all wooden and steel structure cars.

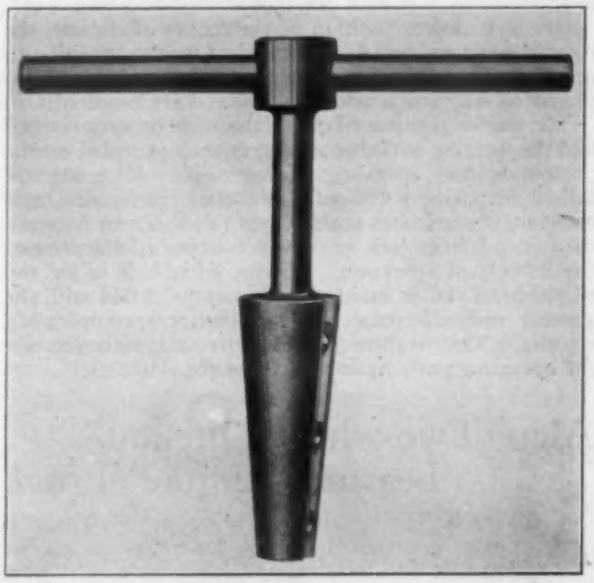
In one railroad test, removing and running up 1-in. hexagon nuts on locomotive cylinder head studs (26 nuts per cylinder; time allowed under the bonus system, 25 min. per cylinder), the entire job was accomplished by the 71 R in ten minutes, including final tightening. On another test on wooden freight cars, it was found that the use of the Thor wrench eliminated the necessity of counter-sinking by pulling the bolt heads into the wood.

The pneumatic wrench is a one-man tool, weighing 26 lb., and is exceptionally easy to handle. It allows the setting of nuts in close quarters quickly and conveniently. The free speed of the machine at a pressure of 90 lb., per sq. in., is 105 r. p. m. The overall length of the spindle is 5 in. and the distance from the center of the spindle to the outside of the case is 1 13/16 in. The distance from the center of the spindle to the extreme end of the throttle is 22½ in. The machine can be equipped with various size sockets from ½ in. to 1 in. to accommodate the size nut that the job requires.

Sunbeam Valve-Well Cleaning Tool

WHEN valves have been in use on turbo-generators for some time, the valve well, or that part of the turbine head which receives the valve, becomes corroded at the steam port holes, and a deposit of lime or other foreign matter, owing to impurities in the water, is made at the ports. This interferes with the seating of a new valve if such deposit and corrosion is not properly cleaned away.

The Sunbeam Electric Manufacturing Company, Evansville, Ind., is exhibiting a valve-well cleaning tool



The Sunbeam Valve-well Cleaning Tool

made from hardened steel and of the exact taper of the Sunbeam valve. The surface of the tool is covered with a fine piece of emery cloth which is fastened on in such a way that is readily renewable. By renewing the emery cloth when necessary, an accurate taper is maintained and the valve wells can be cleaned so as to insure accurate fits at all times.

One dozen emery cloths are supplied with the tool and additional cloths can be purchased at a nominal cost. The old cloth can be removed and a new one applied to the tool in a few minutes by loosening and tightening three screws.

Spun Glass Retainer Mat for Car Lighting Battery

ONE of the exhibits of the Gould Storage Battery Company, Inc., 250 Park avenue, New York, is a Kathanode storage battery for car-lighting service in which is contained a patented retainer mat of spun glass placed against both surfaces of the positive plate. The purpose of this mat is to hold the active material in place under the most severe operating conditions.

The retainer mat is strong and flexible. It is highly porous, permitting a free supply of electrolyte to the surface of the plate. It offers no electrical resistance and is not affected by the action of acid. With the retainer mat, a high capacity positive plate can be used which gives a battery of improved voltage characteristics, rapid recovery after discharge and high capacity.